HNOLOGY DEPT.

Gas Journal

Vo . 267. 103rd Year. LONDON, AUGUST 1. 1951. No. 4600. Price 1/-

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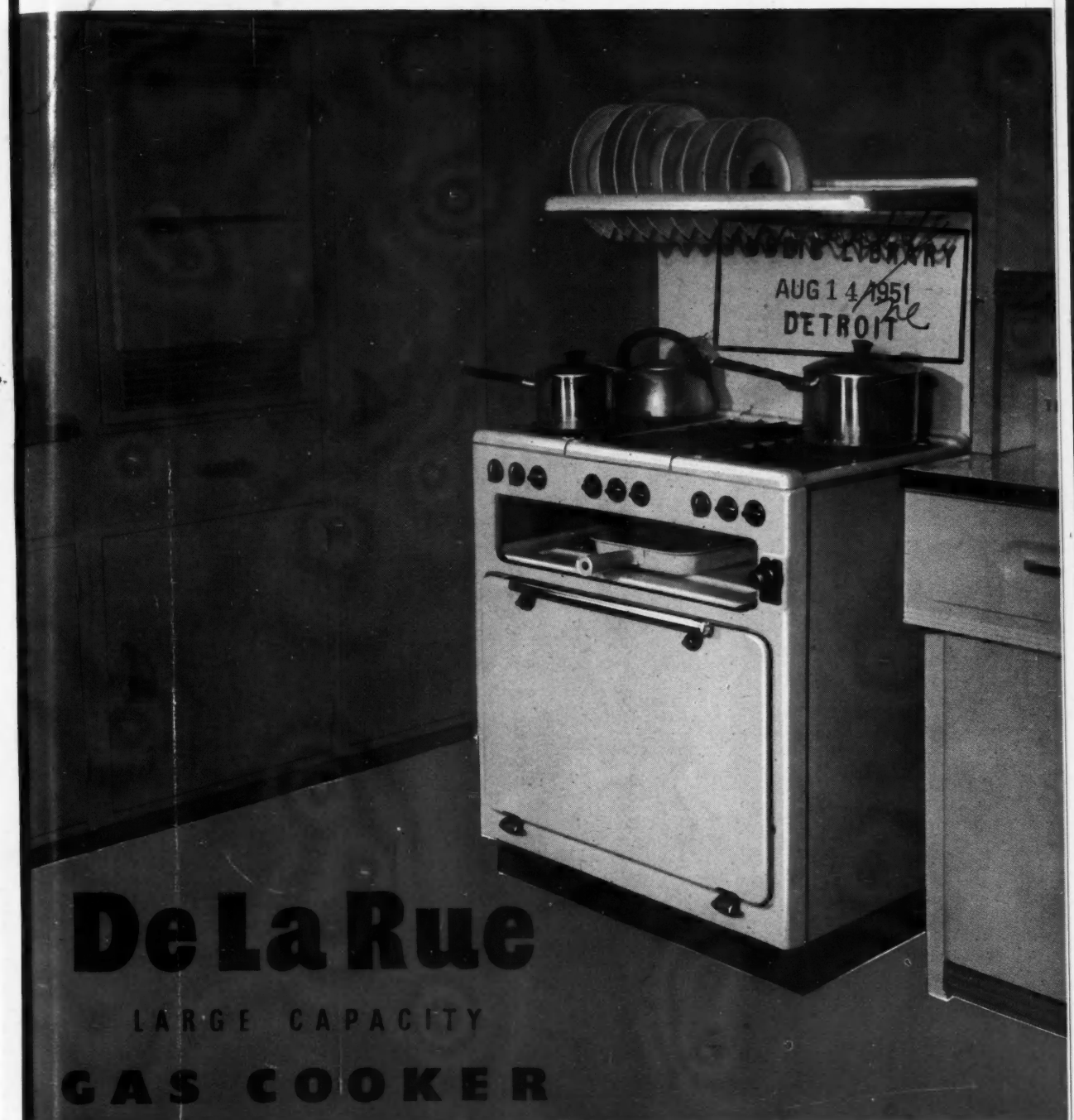
DETROIT



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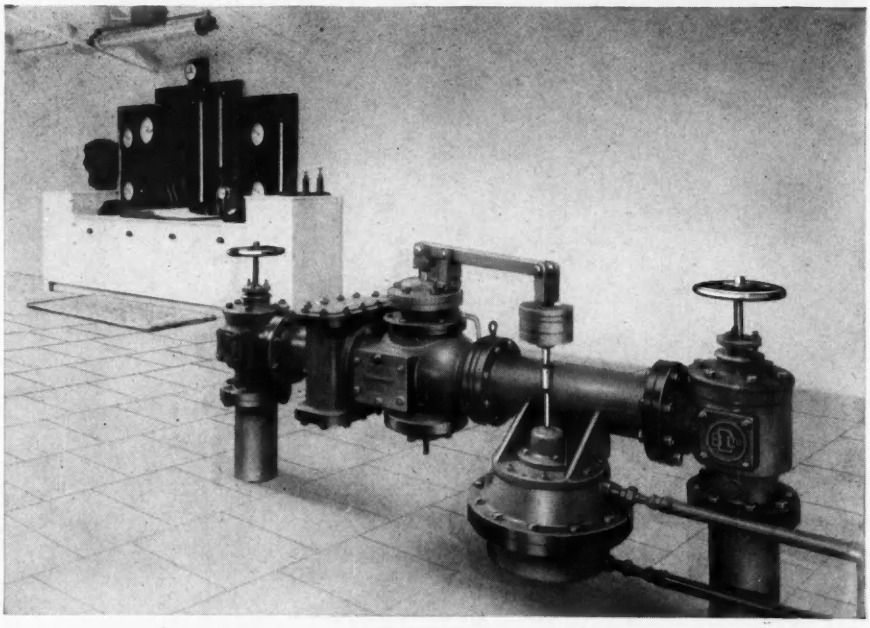

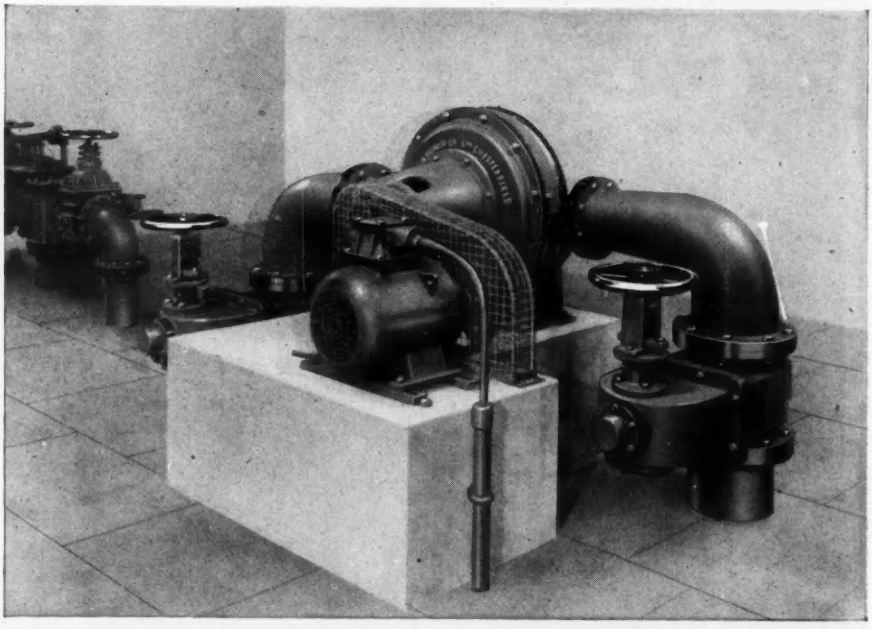

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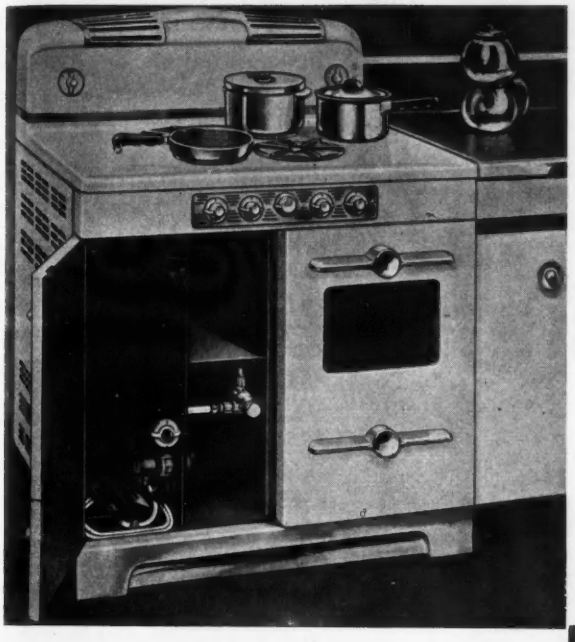

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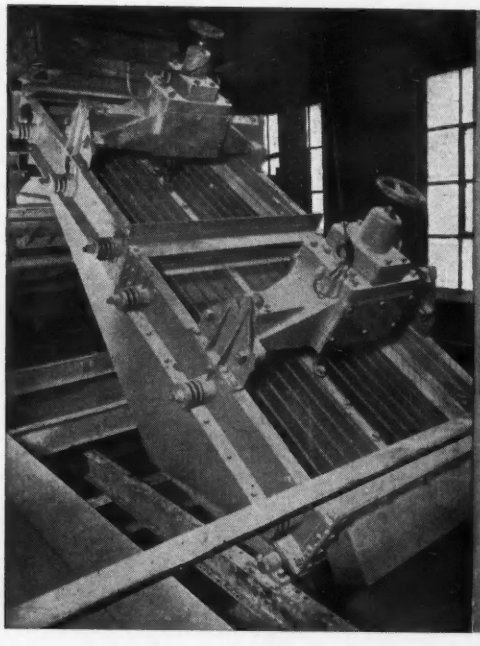

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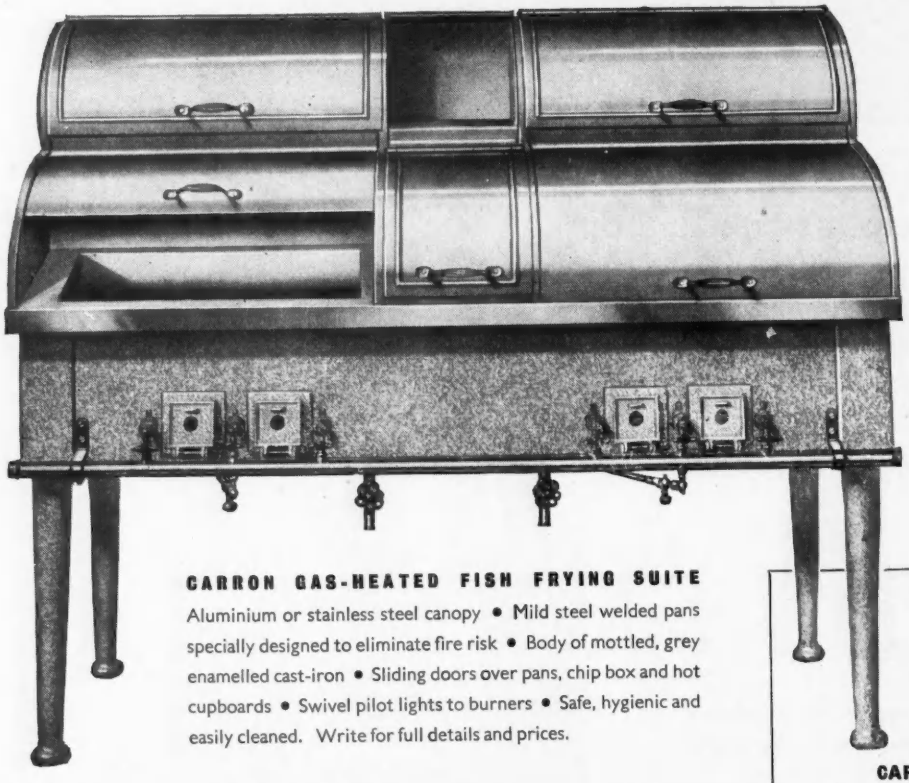

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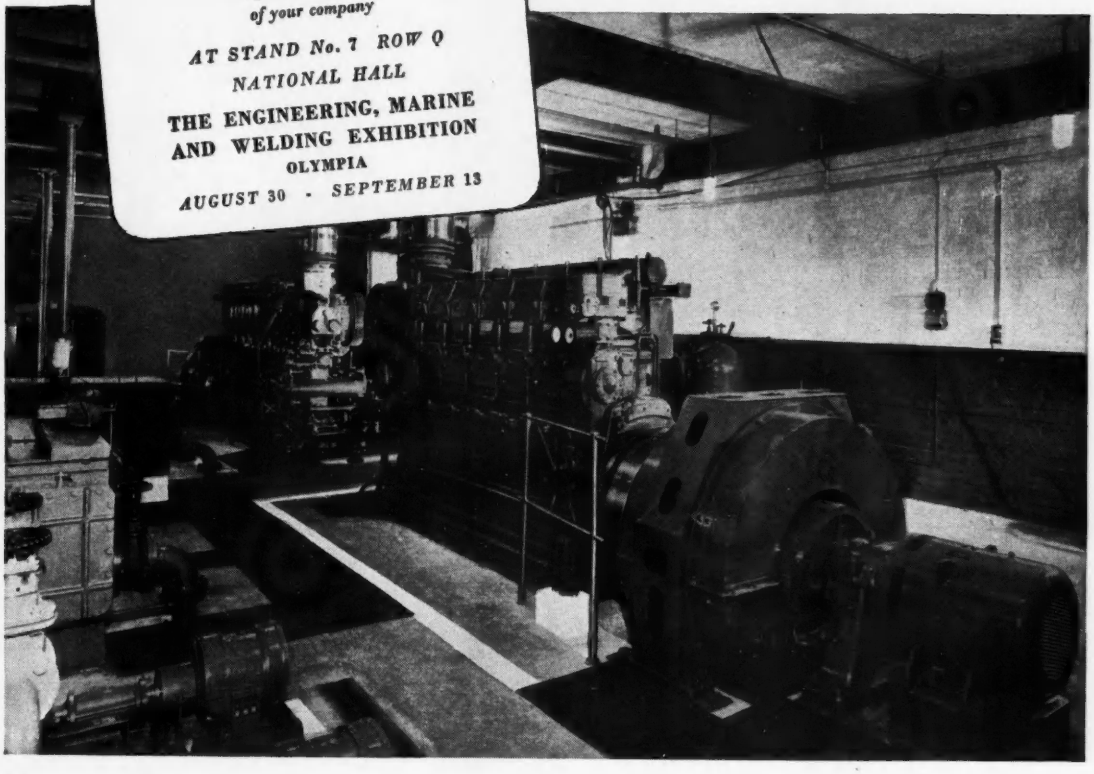

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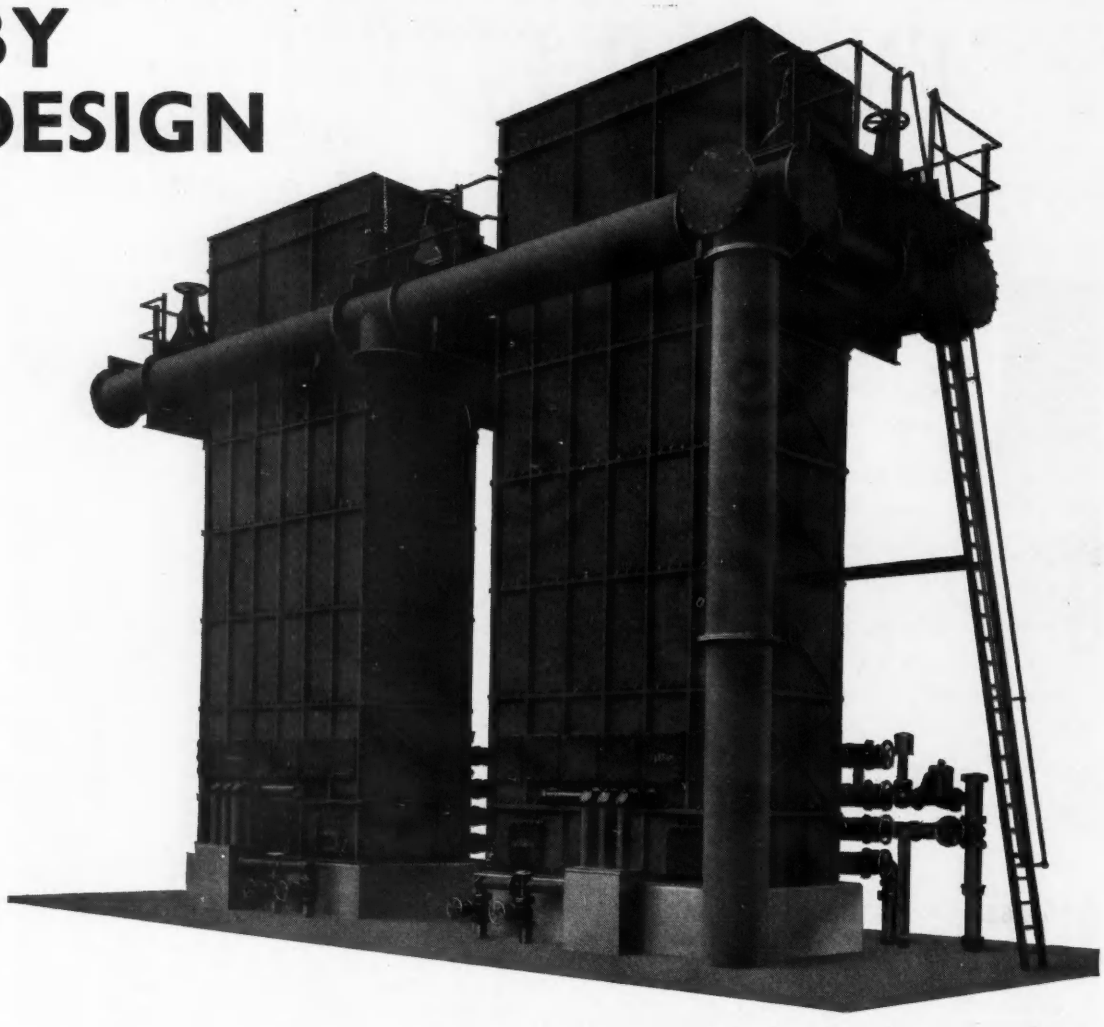

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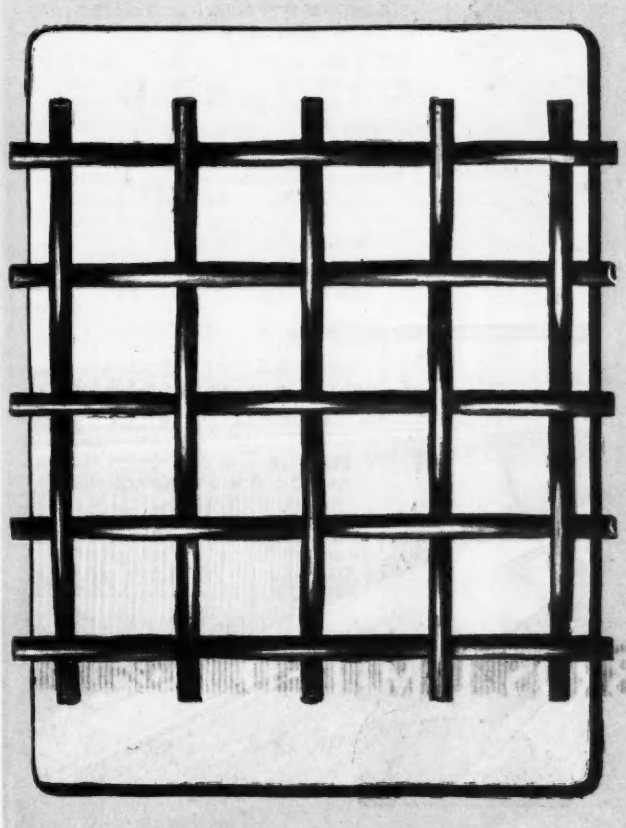

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503/4 A small multipoint heater with pressure proof coil type heating body, built-in rotary gas control cock and connection for distant draw-offs. This heater is not fitted with water taps.

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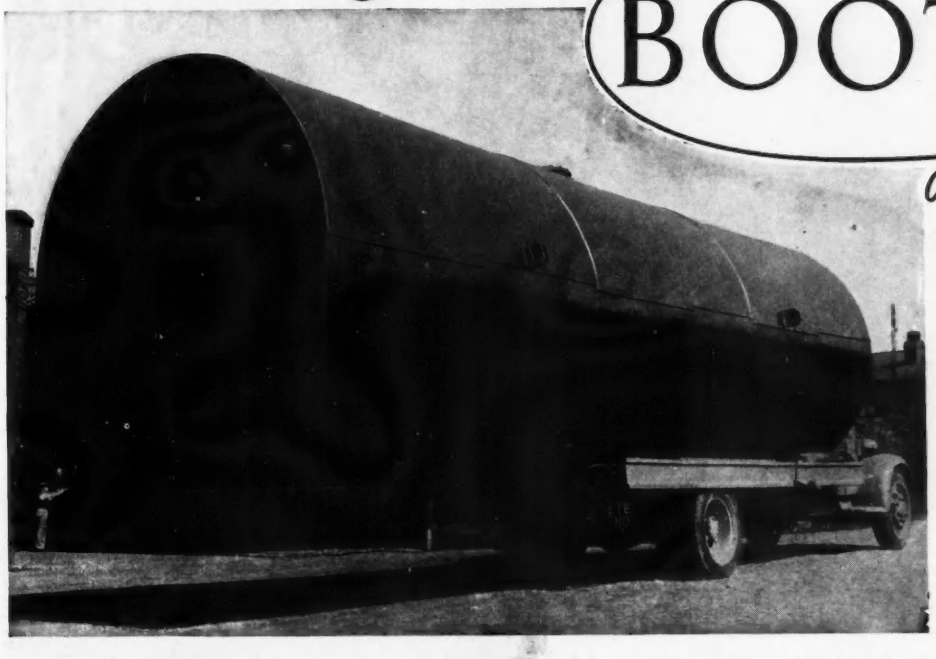

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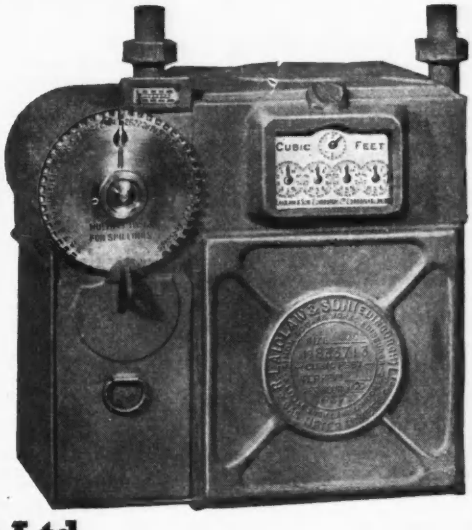

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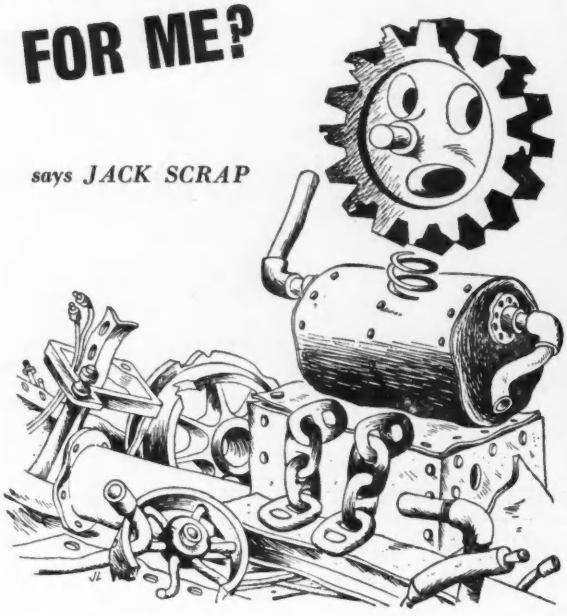

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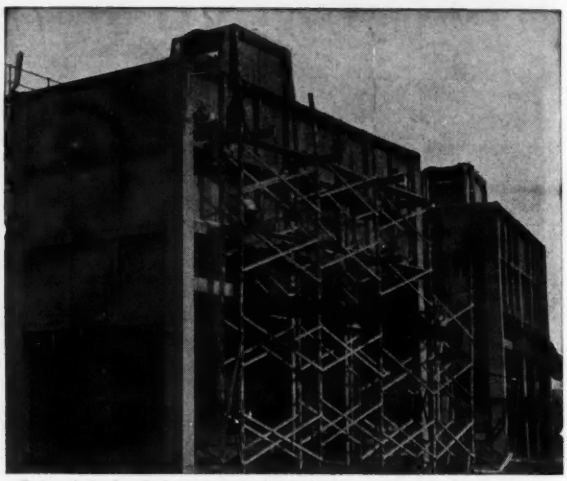
Gunite



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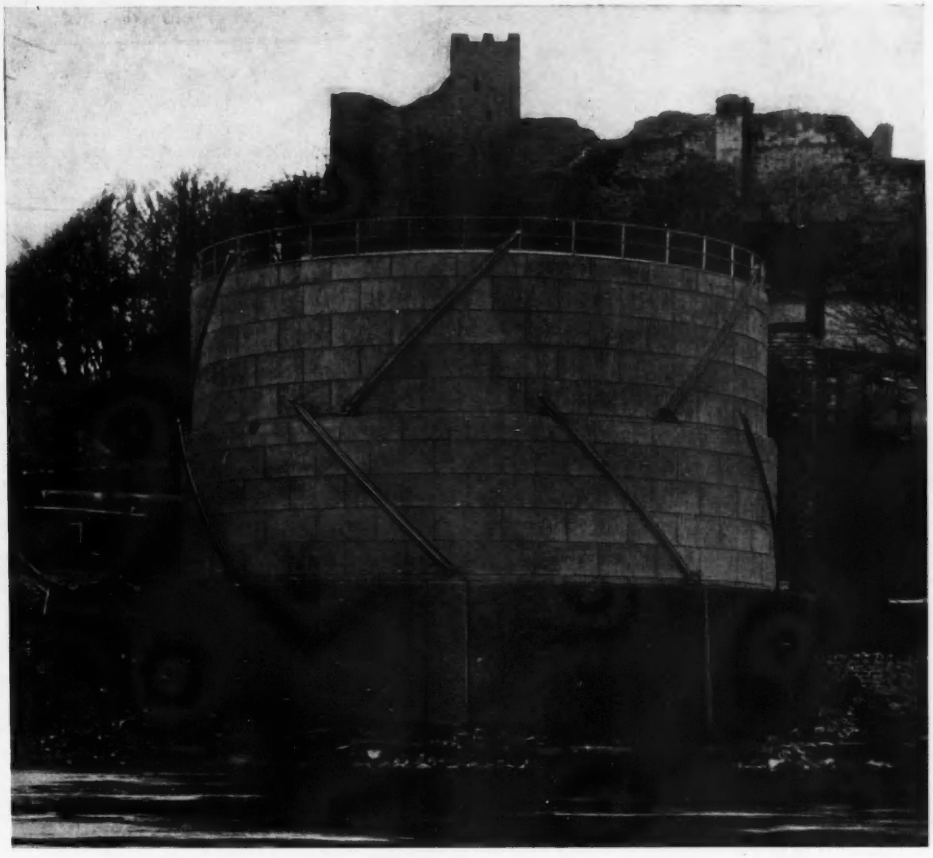

A Two Lift Spiral Guided Gasholder erected at Richmond (Yorks). The photograph shows Richmonds' Historic Castle in the background with the River Swale in the foreground. This Gasholder does not mar the amenities of this famous Yorkshire Beauty Spot

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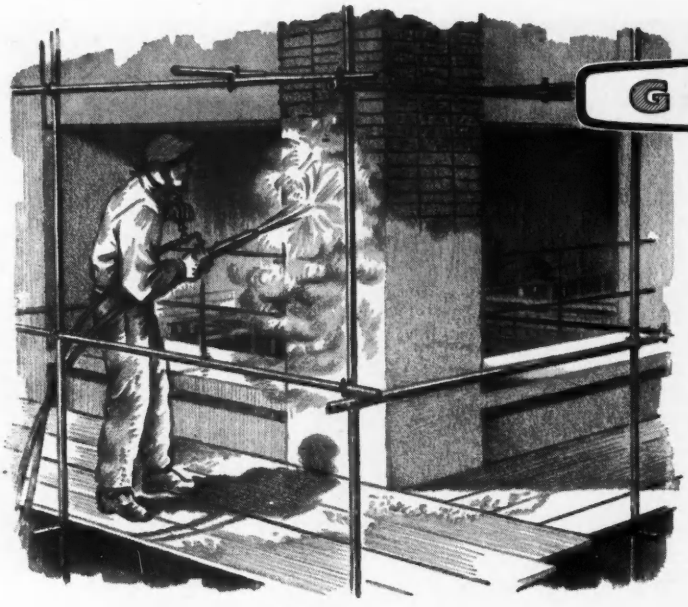

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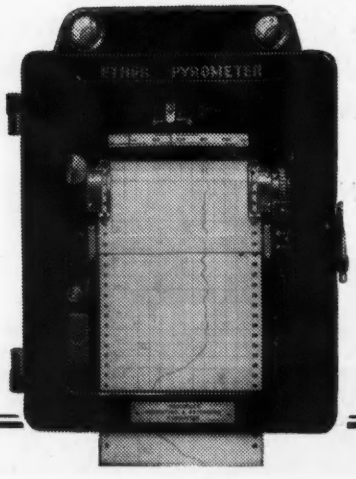

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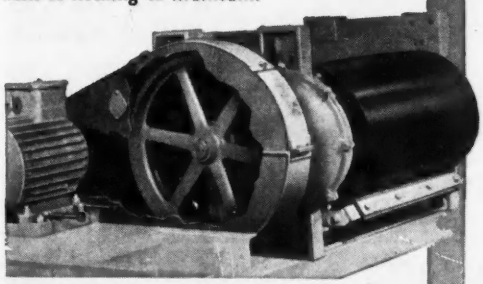

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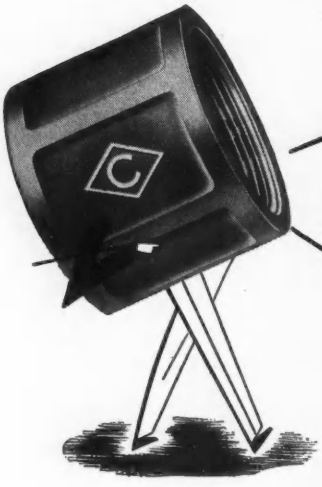
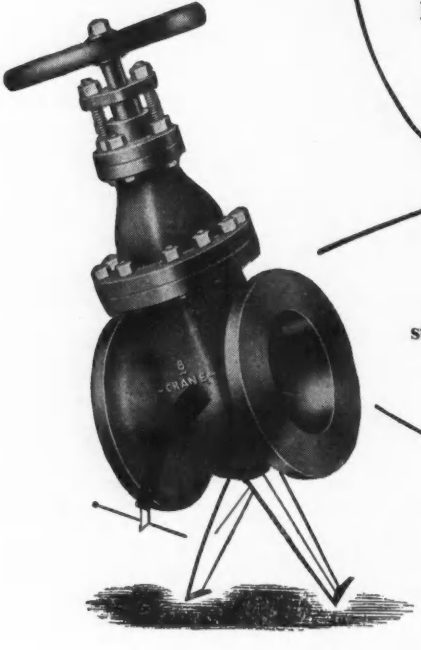


Crane Malleable Iron Banded Socket—Sizes: (equal and reducing) ¼″—6″. Black and Galvanised.

Crane Malleable Iron Strapped Drop Elbow. Sizes: ¼″—1¼″. Black and Galvanised.



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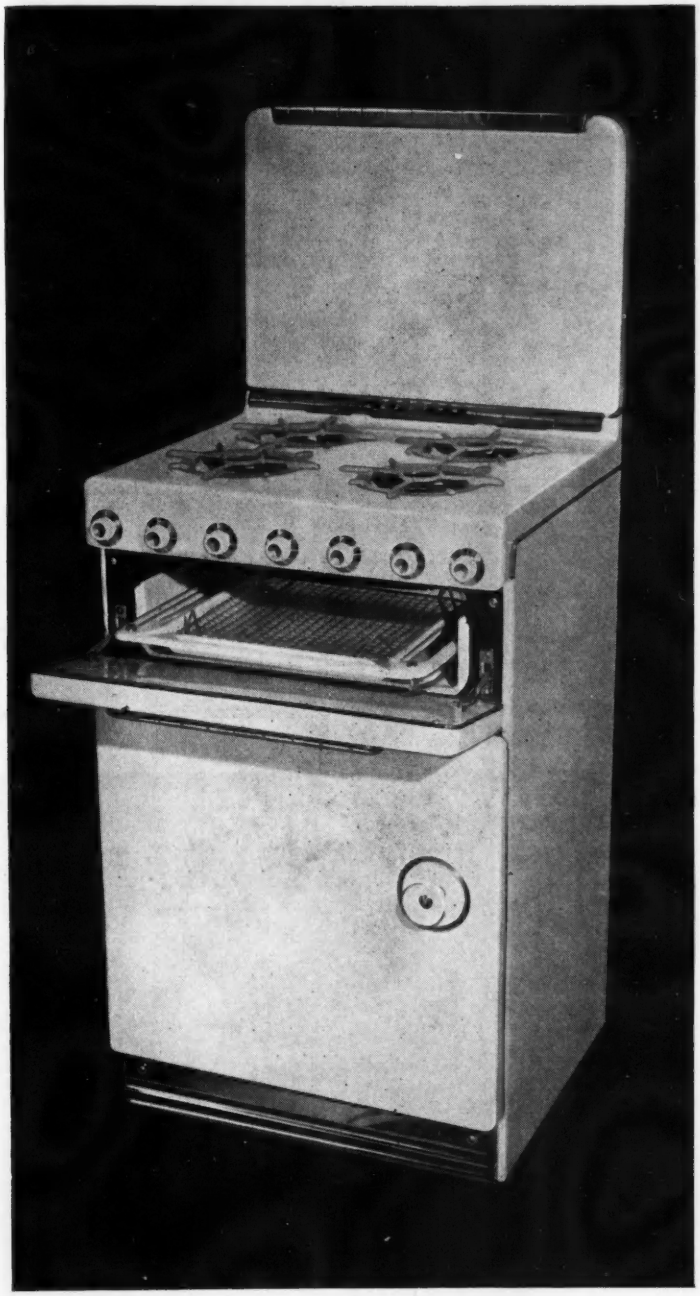

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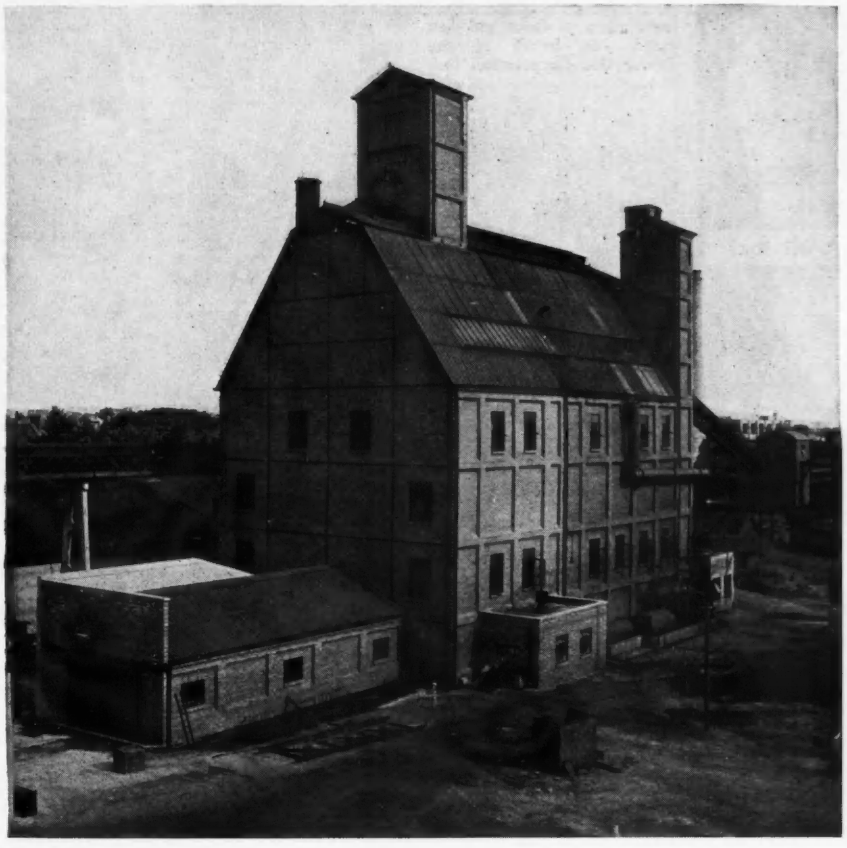

Illustration by courtesy of the North Eastern Gas Board.

1.8 million cu.ft./day C.O.L. Intermittent Vertical Chamber Plant at Bridlington Gas Works.

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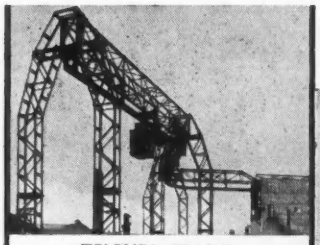

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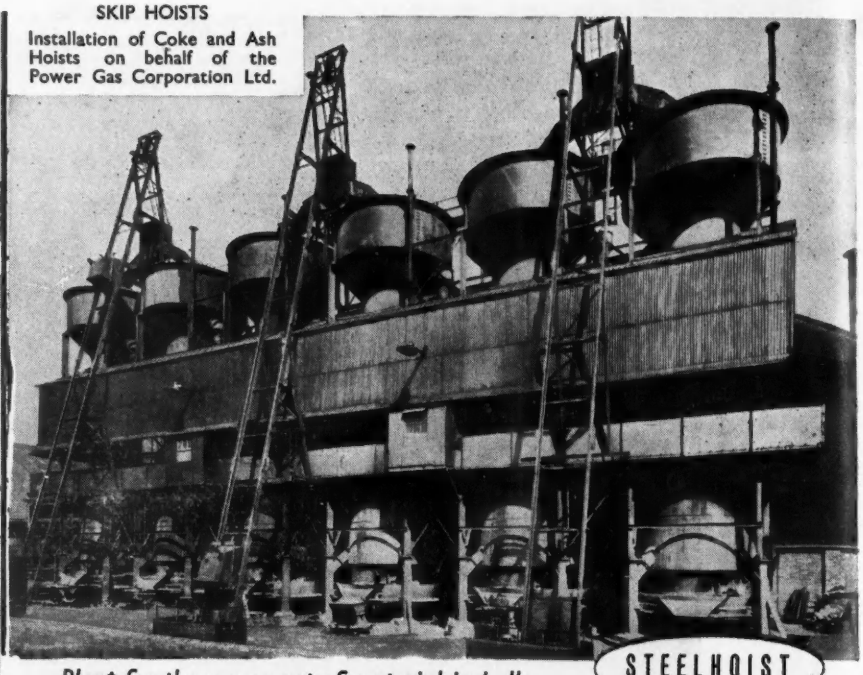

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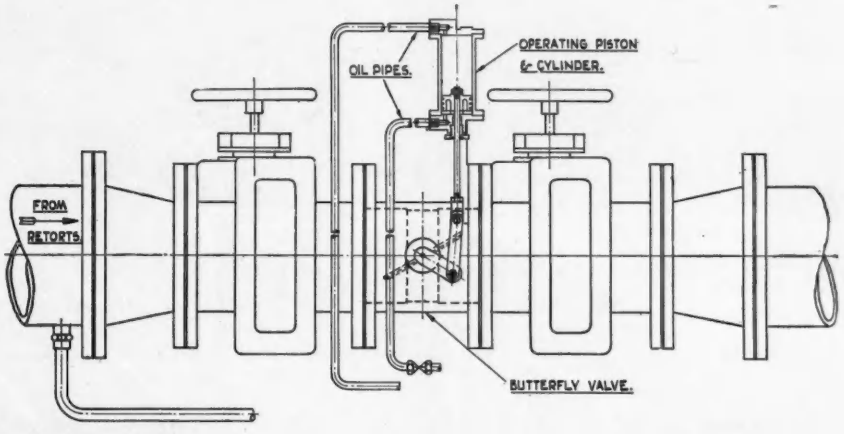

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GOVERNOR FIGURE 81

The initials in the title of this governor stand for Butterfly Valve Relay, which are the main component parts of this simple but very effective piece of apparatus.

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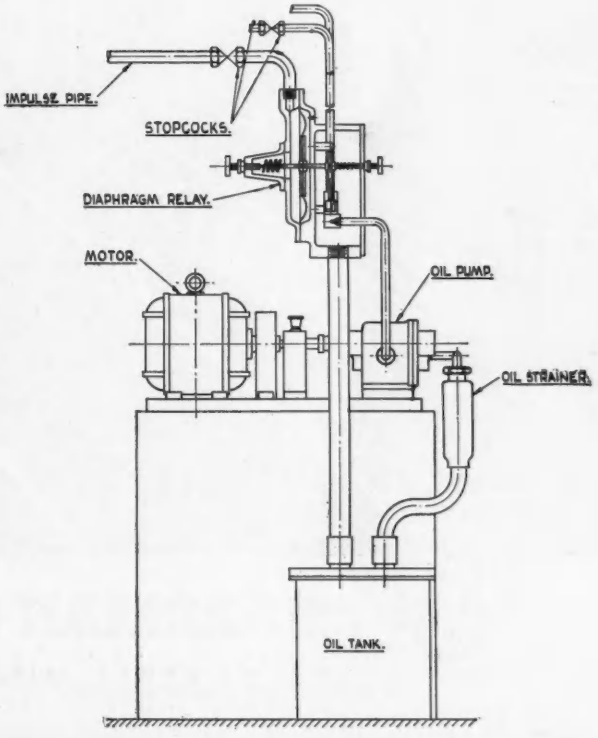

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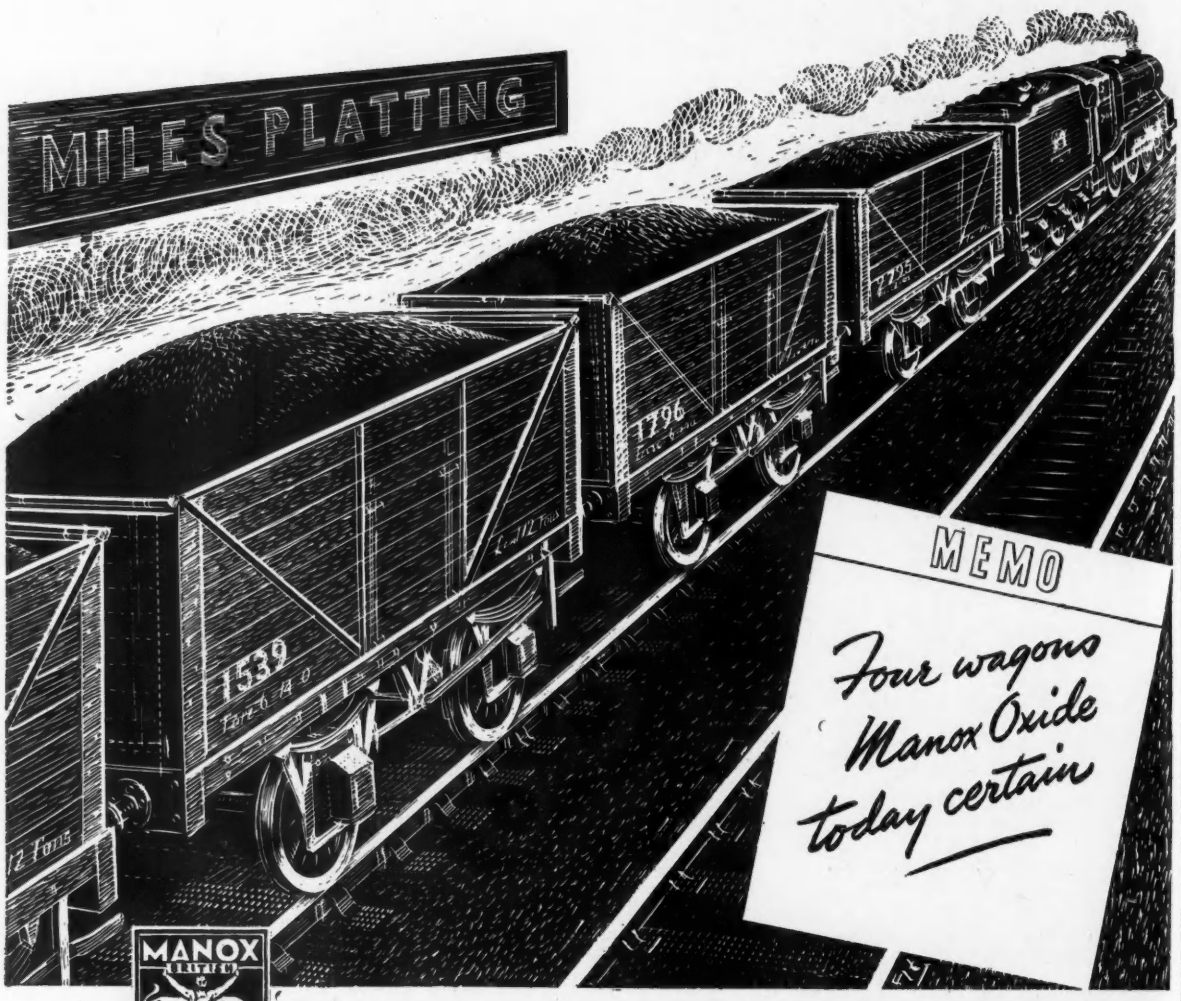

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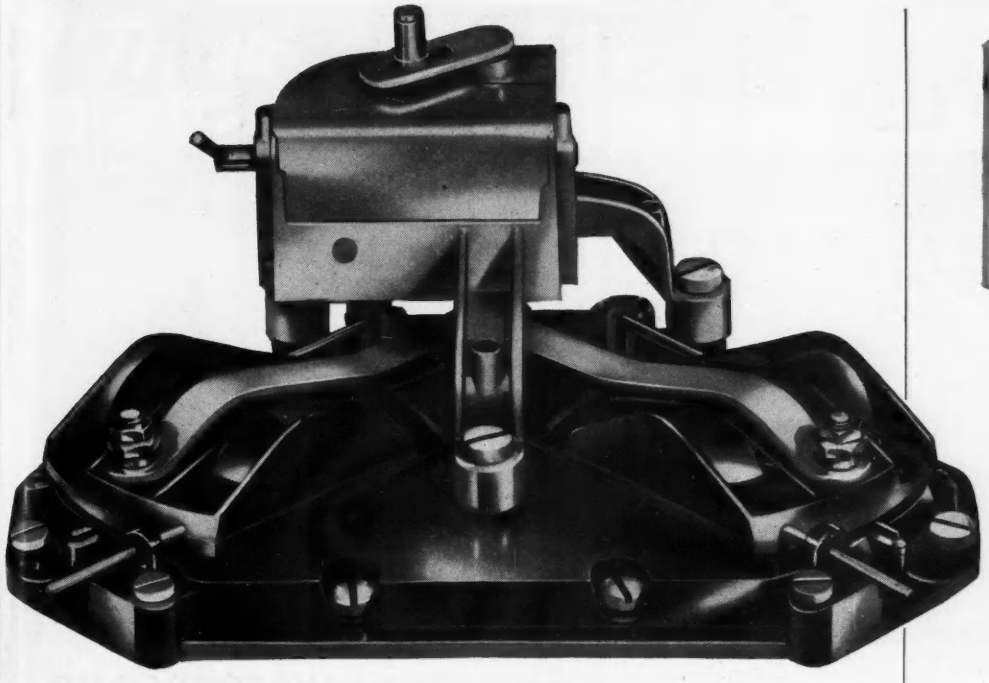

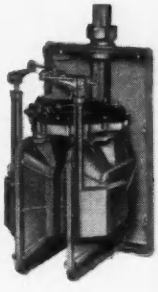

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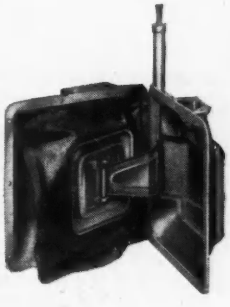

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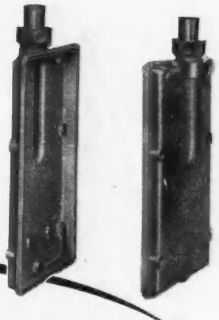

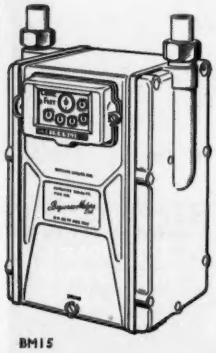

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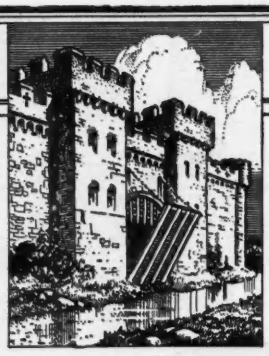

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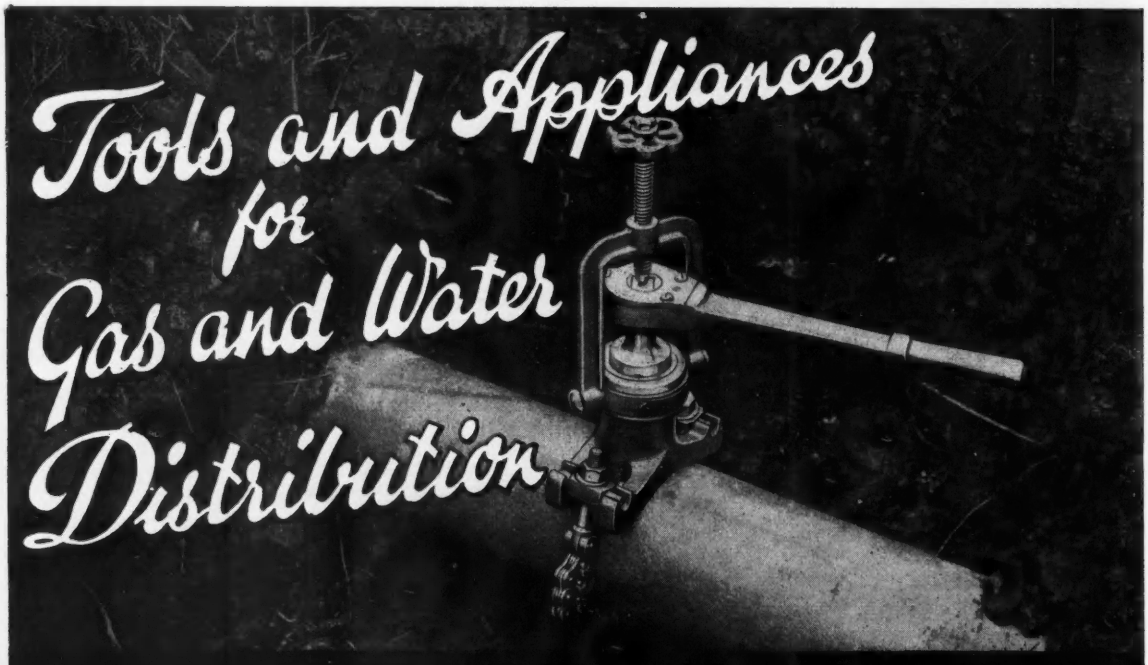

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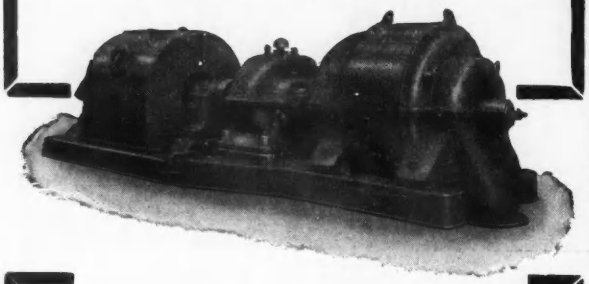

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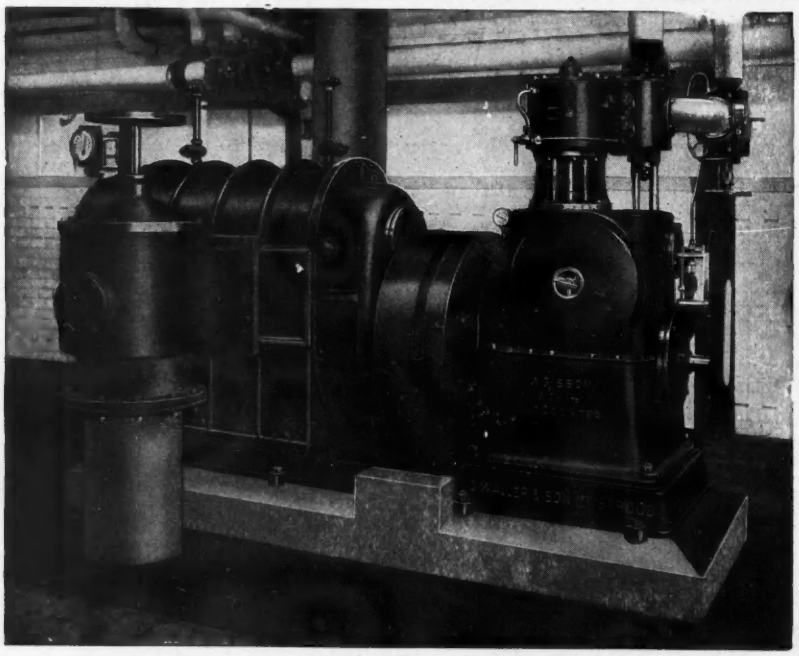

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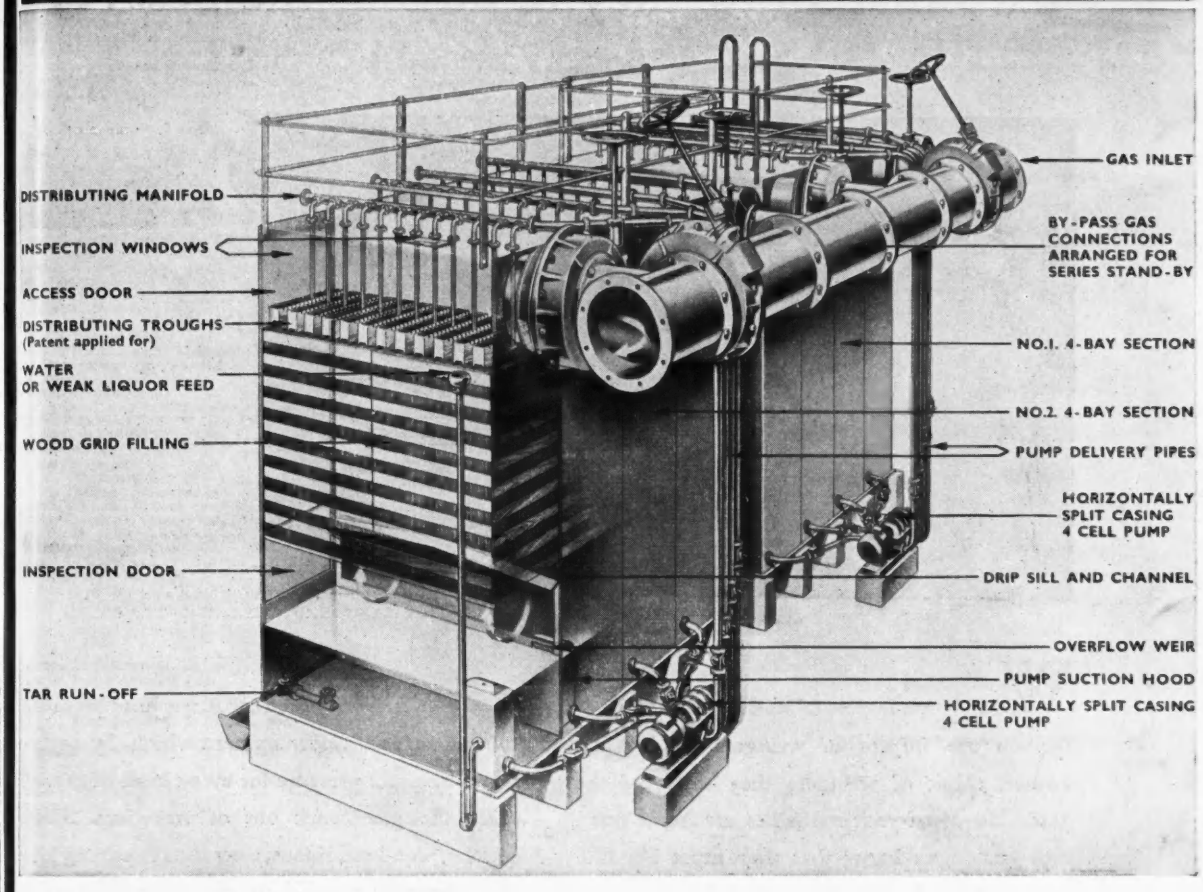

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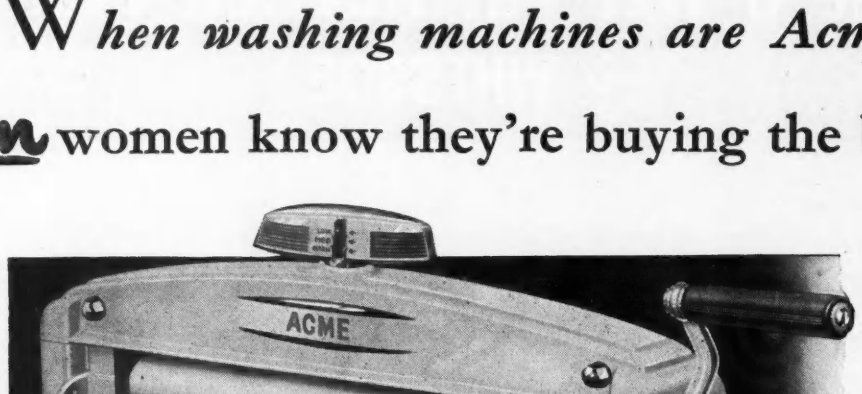

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103rd YEAR OF PUBLICATION

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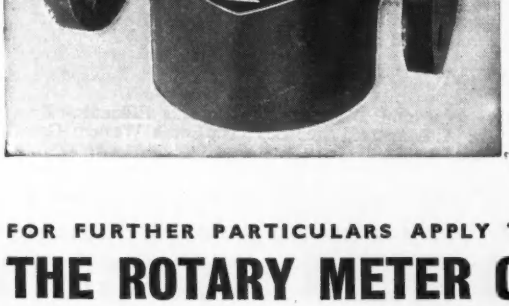

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GAS JOURNAL

VOL. 267. No. 4600 103RD YEAR AUGUST 1, 1951

FRUSTRATION AND LEADERSHIP

WE have had the opportunity of examining the scheme of development in the highly industrialised area of the North Western Gas Board, and we have been impressed by the firm, long-term planning and by the real enthusiasm of those who are working, as a team, towards the satisfaction of a demand for gas which we believe would not have been envisaged prior to 1949. The essence of the problem—a problem into which politics have entered to stay—is non-political. Its solution is a matter of very broad policy covering the administrative and the engineering aspects alike and in the same breath. Its solution calls for enlightened policy, much experience in integration, encouragement of skilled effort, and, above all, co-operation at all levels. From what we have seen in the North Western area we are convinced that these fundamentals are not lacking and that the next 15 years will witness a wholly remarkable change for the better in gas supply to home and industry.

The majority of undertakings taken over by the Board were municipally owned. Civic pride, which nobody can despise, abounded and still permeates local life. Gas supply, however, under modern conditions demands integration of area, of distribution system, of manufacturing plant, and of sales policy. The high, formidable, impenetrable, barriers of municipal gas ownership (and the same argument applies to former non-grouped company undertakings) had in the national interest to be swept away—and they were swept away on May 1 of 1949. There were heartburnings in many districts, a good deal of suspicion, and 'frustration' (that modern complex of the soul). The element of this peculiar complex certainly reared its head and made its voice felt in the North Western area, noted not only for its individuality, drive, and tenacity, but also for its obstinacy. We believe that this frustration, symptomatic perhaps of life in Great Britain to-day, has, through wise leadership, dwindled to mythical proportions. We cannot, in fact, see why, in an area so rich in possibilities —and, we would add, with much leeway to make up—frustration should be at all the order of the day. To our mind a better word would be weakness.

There was certainly no atmosphere of frustration at the meeting of the Manchester and District Section of the Institution of Gas Engineers held at Bolton and Wigan on July 20. The luncheon in Bolton's gracious and spacious Town Hall was attended by full representation of both the North Western and the North Eastern Gas Boards, and the dominant note was one of good comradeship, sincerity of motive, and lively and practical encouragement. We are not at the moment writing a eulogy of the North Western Gas Board, who acted as hosts; we may well return to this aspect later, for the work they have in hand, humanitarian as well as strictly technical and engineering, commands respect by virtue of its virility alone. What we would like to do at the present juncture is to call attention to the speech made by the Board's Chairman, Mr. D. P. Welman, at the luncheon, reported on page 278. Mr. Welman has high hopes and no fears, and we are sure that his energetic policy will unite a heterogeneous, highly individualistic area in common purpose for the general weal.

ALKALI INSPECTORS' REPORTS

BETTER planning of process buildings, good roadways, and the setting out of grass lawns and flower beds have not only produced more attractive conditions for the workpeople but their provision has resulted in more careful operation and greater cleanliness with a consequent improvement in the general amenities of the districts in which chemical works are situated. This view is expressed in the annual report of the Chief Alkali Inspectors of the Ministry of Local Government and Planning and the Chief Inspector for Scotland, to

which we make more detailed reference on p. 280. The Inspectors point out that on the whole the chemical industry is in a very healthy state, despite the many difficulties it has had to meet. So far as the by-products of the gas industry are concerned, the continuing tendency to concentrate tar distillation at large central installations was reflected in a further fall from 175 to 162 in the number of tar works registered. This further concentration was accompanied by an overall increase of 47,660 tons (bringing the annual total to 2,528,950 tons) in the quantity of tar distilled in England, Wales, and Scotland.

Benzole recovery at gasworks was limited during 1950 by the overriding necessity of maintaining the volume and calorific value of gas supplies, and exports of pitch were somewhat reduced, with a resulting accumulation of stocks. Coke ovens were worked to capacity; some old uneconomic batteries were shut down but several new installations were in course of construction. The Chief Inspector for Scotland refers again to the fact that most of the by-product ammonia from gasworks goes to waste apart from a small usage for other purposes. An investigation of this waste in conjunction with the Scottish Council for Development and Industry was continued, and the possible use of the ammonia either directly or indirectly as a nitrogen fertiliser showed most promise.

During 1950, the Inspectors paid 3,970 visits to works at which industrial processes are carried on, the effects from which are liable to cause danger or nuisance in the areas in which they are situated. Although a number of infractions against the provisions of the Alkali, etc., Works Regulation Act, 1906, were recorded, there was no deliberate evasion, and prompt remedial action having been taken, it was not necessary to institute legal proceedings in any case. With the present great expansion of Britain's oil refining capacity, the problem of dealing with noxious gases has become a major one. Discussions have been held between the Chief Alkali Inspectors and the oil interests concerned, with the result that the best means of preserving local amenties in each case have been agreed.

Attention is called to the likelihood of a shortage of brimstone supplies, and the Inspectors state that this may well lead to difficulties in the sulphuric acid trade with consequent serious repercussions to British industry in general. Careful consideration therefore should be given to every possibility of recovery of sulphur or its compounds from materials hitherto regarded as waste. Some 1,776,000 tons of sulphuric acid were produced in Great Britain during 1950. Nearly two-thirds of this were made in contact plants, the remainder being produced in leaden chambers. Power stations in Great Britain consume annually about 30 mill. tons of coal, and the rate of consumption is increasing. In spite of the continual expansion that is taking place, the extent of grit emission should automatically decrease because the greatest quantity arises from the older and more inefficient stations. The use of these will be progressively reduced as new plants become available, and they will be closed altogether when the installation of new plant has caught up with requirements. There is a direct financial incentive to achieve this as soon as possible because fuel costs at the older stations are much in excess of those at the modern stations.

BEHIND THE SCENES

ALTHOUGH the Festival Fare National Cookery Contest has now passed into history we return to it again this week for a special reason. Throughout all the intermediate stages of the competition, and at the final, bouquets have been handed out to all those responsible for the planning and organising of this great publicity effort. Local and national celebrities have been drawn in and duly thanked for their interest and support—and the thanks have been as genuine as they have been merited. But one body of people to whom we owe in large measure the success of the competition has been rather overlooked among the many whose efforts have been praised. We refer to the gas fitters up and down the country who have put in so much hard work to prepare innumerable kitchen units so that every one of the huge number of entrants could compete under the best possible conditions.

The equipping of these individual kitchens—often in the most unusual situations, where gas and water supplies, let alone waste pipes, were anything but handy—must have provided many a headache. Typical of the problems which the fitters had to solve was that at the Final of the Contest, when 12 complete kitchens had to be set up in the ballroom of a London hotel. We have—not inappropriately we think—called it a masterpiece of improvisation; and while our article on later pages of this issue deals specifically with the achievement of the North Thames Gas Board fitters, we publish the story as a tribute also to the achievement of all those other fitters throughout the length and breadth of the land whose painstaking work contributed so much to the success of this historic contest.

A DREAM COME TRUE

The twin Tyne tunnels for cyclists and pedestrians between Jarrow and Howdon were opened last week by Mr. Alfred Barnes, Minister of Transport, who described the scheme as 'a dream come true' for the people of Tyneside, a dream long cherished on both sides of the river. The project was planned 14 years ago and provided for a major tunnel for vehicular traffic as well as the two secondary tunnels but it was later decided in the interests of national economy to proceed only with the latter. Mr. Barnes pointed out at the opening ceremony that with regard to an appeal for an early start on the major tunnel, this was linked closely with the Dartford tunnel on which big sums had been spent, but on which work was now closed down indefinitely. The shields for the Tyne tunnel were in the Dartford tunnel, and until that was completed there was little chance of getting them for the Tyne tunnel. A feature of special interest to the gas industry about the tunnels opened last week is that they carry a gas main representing an important link in the network of the Newcastle division of the Northern Gas Board—probably the first of its kind laid in tunnels constructed for normal traffic and not built specially for the housing of services. The main comprises 1,200 yards of 18 in. spun iron main from the Howdon works to the tunnel entrance, where it is divided into two 12 in. steel mains, re-connected to a

single 18 in. main at the top of the escalator shaft on the opposite side of the river. We published a description of the main while it was in course of construction and open to inspection by gas engineers on June 14 last year (p. 703). Most of Newcastle's gas is made on the south side of the river and consumed on the north side; the value of the new main linking the two parts of the Tyneside industrial area is therefore obvious. The deferred scheme for the construction of the main tunnel is estimated to cost £5 mill. The twin tunnels now in use cost £833,000.

CHURCHILL GARDENS

THE Pimlico housing scheme, all the flats of which are centrally heated and supplied with water heated from the waste of Battersea power station on the other side of the river, was described at some length in these columns on June 6. We return to the subject now only to report the official opening by the Duchess of Marlborough and the fact that the project has been christened Churchill Gardens. At the same time it may be of interest to note one or two facts and figures relating to the scheme as a whole. In the first place, it is an extremely expensive undertaking. The first section comprising 495 flats and 13 shops will cost, including the site, £1,750,000. There is a total weekly subsidy for each flat of about 36s. but even allowing for this, some deserving tenants cannot afford the rent while it is felt others better off should not be subsidised. This raises several issues, but Westminster is one of the few local authorities which has tried to meet the position with a rent rebate scheme. The maximum rent is fixed at a sum which omits all subsidies, while the minimum rent is fixed at a little higher than the rent of pre-war schemes. The maximum for a three-roomed flat is 55s. 6d., plus 5s. 4½d. for rates and water and 8s. for heating and hot water, making a total of £3 8s. 10d. The minimum exclusive rent for the same flat is 19s., plus the same additions.

Among those present at the opening ceremony was the Minister of Fuel and Power who described the scheme and the 126-ft. hot water accumulator in particular as 'a very timely Festival exhibit.' The figures he quoted were similar to those stated in the recent papers on the subject by Mr. A. E. Margolis, although the latter's estimate of 11,000 tons of coal saved per year was reduced to 10,000 in the Minister's remarks. The efficiency of the scheme and its economical operation will be watched with interest by heating engineers the world over, but whatever scepticism may remain, it must be conceded that the Westminster City Council deserves high praise for its courageous adoption of a scheme whose results, good or bad, will certainly add to our store of knowledge.

COAL UTILISATION

IN its report for 1950 the Coal Utilisation Joint Council says it considers that for gas and electricity to supply the whole domestic load in smokeless zones would be both impracticable and contrary to the Government's policy that the main winter domestic heating and hot water loads should be borne by solid fuel. Of a total annual domestic consumption of 35 mill. tons of solid fuel, only 6 mill. tons are at present smokeless. It is claimed that the present situation gives point to the Council's two-fold aim of securing the most efficient use of solid fuel in the home and encouraging the best use of fuel from the national, as well as the individual, point of view. While supporting smoke abatement the Council gives a warning against the danger of exhausting the supply of suitable fuel. It considers that the production of smokeless fuel is unlikely ever to increase sufficiently to enable bituminous coal used in the home to be replaced, and suggests that the only practicable solution to the problem is the progressive development of appliances capable of burning coal with less and less smoke. Another point made in the report is that it would be better if the declaration of smokeless zones could be confined to new towns or redevelopment areas, which could from the start be equipped with suitable apparatus.

A plea for more hire purchase facilities for domestic fuel-saving grates and slow combustion stoves has been made by the Council to Mr. Philip Noel-Baker, Minister of Fuel and Power. 'Gas and electrical equipment,' says the report, 'can be purchased on most advantageous hire purchase terms (financed, it is understood, by the industries themselves). In the result, when improved heating services are desired, householders tend to regard modern solid fuel appliances as beyond their reach.' Only a minority of distributors of solid fuel appliances offered hire purchase terms before the war, and at present no new schemes for hire purchase or credit sales facilities requiring the backing of banks or finance houses may be introduced without Treasury approval. An obstacle to the granting of such approval is the difficulty of limiting facilities to the buying of fuel-saving appliances and the exclusion of 'luxury' articles.

Personal

M. L. G. Humphrys, local Manager, Bexhill, has been appointed Engineer to the North Sussex district of the South Eastern Gas Board. Mr. Humphrys was appointed Engineer and Manager to the Bexhill Water and Gas Company, a title he retained throughout the ownership of the Bexhill Corporation until 1949, when he became Manager for the Board.

◇ ◇ ◇

A line was accidentally omitted from last week's announcement of the appointment of local Directors of the Consett Iron Company, Ltd. Mr. H. V. Tomlinson is Manager, Works Production, and his name should have been followed by that of **Mr. G. M. Nave** (Manager, Coke, By-product, and Brick Works), who has also been appointed a local Director.

◇ ◇ ◇

Their many friends in the gas industry will join in offering congratulations and good wishes to **Mr. and Mrs. A. J. West** on the occasion of their golden wedding, which they celebrated on July 28. Mr. West was for many years a Director of Parkinson and Cowan, Ltd., and on his retirement four years ago he had completed 50 years' service with that Company.

◇ ◇ ◇

Appointments approved by the West Midlands Gas Board on July 19, include those of **Mr. G. A. Bentley** (Deputy Gas Engineer, Newark-on-Trent), as Assistant Group Engineer, Cannock group; **Mr. G. W. Harvey** (Assistant Engineer, Lichfield and Tamworth), as Acting District Engineer, Lichfield district; and **Mr. W. R. Bartlam, Mr. G. F. Clarke,** and **Mr. P. D. Stace** as Chemists at the Central Laboratory, Birmingham.

◇ ◇ ◇

Mr. A. J. Beanland, B.SC.TECH., A.M.I.E.E., has been appointed Assistant General Manager of the Trafford Park works of Lancashire Dynamo and Crypto (Mfg.) Ltd., as from September 1. Mr. Beanland received his engineering education at the Manchester College of Technology, graduating in electrical engineering in 1932. He then took an apprenticeship course with Lancashire Dynamo and Crypto Ltd. and has since been in the continuous employment of the Company. His latter appointments have been as District Sales Manager at Leeds and Manager of the L.D.C. Fractional Horse Power motor factory.

Obituary

Mr. Frank Wheeler Robinson, who until the nationalisation of the industry was a director of Cleethorpes Gas Company, died at his home on July 21, at the age of 68.

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The death took place on July 21 at his residence, Gasworks House, Donaghadee, Co. Down, of **Mr. William Henry Roberts,** Managing Proprietor of the gasworks there. A native of Scotland, Mr. Roberts settled in Newtownards in 1901 and became manager of the local authority gas undertaking there. Some years later he purchased the Donaghadee gasworks, which provides the town's supply.

Diary

Aug. 30-Sept. 13.—Engineering, Marine, and Welding Exhibition, Olympia. (Gas Council exhibit).

Sept. 4.—East Midlands Gas Consultative Council: Victoria Station Hotel, Nottingham, 11.30 a.m.

Sept. 6.—North British Association of Gas Managers: Annual General Meeting, Ayr. (Golf and bowling functions, Sept. 5; Excursion, Sept. 7).

Sept. 7.—Manchester and District Section, I.G.E.: Visit to Newton Chambers & Co., Ltd., Thorncliffe.

Sept. 10.—West Midlands Gas Consultative Council: Dudley Room, Queen's Hotel, Birmingham, 2.30 p.m.

Sept. 17.—Eastern Gas Consultative Council: Connaught Rooms, Great Queen Street, 2 p.m.

Sept. 18-21.—Association of Public Lighting Engineers: Annual General Meeting and Conference, Brighton.

Sept. 19.—South Western Gas Consultative Council: 34, Bridge Street, Taunton, 11 a.m.

Sept. 19.—Wales and Monmouthshire Section, Institution of Gas Engineers: Autumn Meeting, Llanelly.

Sept. 20.—Gas Council Commercial Managers' Committee: Edinburgh, 10 a.m.

Sept. 21.—Institution of Gas Engineers (North of England Section): 'Some Aspects of Gas Manufacture Practice in the North Thames Gas Board Area', Dr. J. Burns, G.M., Chief Engineer, North Thames Gas Board. Seaburn Hotel, Sunderland.

1951 'Journal' Directory

THE following changes have been notified during the past month. To keep the information in the 1951 edition of the *Gas Journal Calendar and Directory* up to date readers are invited to note these alterations (together with the appropriate adjustments relating thereto in the 'Personnel' section, pp. 137-152):

Page 23.—WALES GAS CONSULTATIVE COUNCIL: Delete: *Acting Secretary,* T. O. Jones, and substitute: *Secretary,* David Jones. Add Councillor E. T. Kinsey Morgan, J.P. (Rhayader), Alderman J. H. Owen (Denbigh) Councillor T. H. Pugh, J.P. (Newton, Montgomeryshire), and Councillor T. Wynne Thomas (Aberdovey), *Members.*

„ 23.—SCOTTISH GAS CONSULTATIVE COUNCIL: Delete W. Baxter, *Member,* (resigned). Add Provost J. R. McKay (Johnstone), *Member.*

„ 33.—GAINSBOROUGH: Delete H. Shackleton, *M.* (removed).

„ 106.—TOWYN AND ABERDOVEY: E. E. Williams, *M.* (vice J. Beech).

„ 106.—LLANIDLOES: Delete E. E. Williams, *E & M* (removed).

„ 108.—LLANRWST: Delete J. D. Rees, *E & M.* (removed).

„ 112.—BILSTON: H. Shackleton, *E & M.,* vice F. Harvey.

„ 180.—NORTHERN JUNIOR GAS ASSOCIATION: *President:* J. E. McManus (Howdon); *Senior Vice-President:* R. Williamson (Sunderland); *Junior Vice-President:* S. Jones (Middlesbrough).

Three-fifths of the £250,000 required to advertise on a national scale the need for householders to use their limited supplies of solid fuel more efficiently and economically will be contributed by the National Coal Board. The advertising scheme will be promoted by the Coal Utilisation Joint Council, which, in its report, states that electricity load shedding and the dislocation of industry and other inconveniences asociated with it would have been largely avoided if solid fuel had been used for the main winter domestic space and water heating. Mr. Philip Noel-Baker, Minister of Fuel and Power, has stated that, even if the weather was normal, the consumption of coal in the United Kingdom this winter might well be at the annual rate of 17 mill. tons more than it was in 1949. Output could not keep up with consumption if consumption went on increasing as it was doing.

SOUTH WESTERN SECTION CHAIRMAN'S DAY

The informal luncheon party on the occasion of the summer meeting—Chairman's Day—of the South Western Section of the Institution of Gas Engineers at Exeter on July 4. Mr. H. H. Brown, Manager of the Exeter Sub-Division, presided.

INTERNATIONAL COMMISSION ON ILLUMINATION

THE 12th session of the International Commission on Illumination was held in Stockholm from June 26 to July 5. This year the Commission celebrates its Golden Jubilee, and it is interesting to recall that the Commission owes its origin largely to the gas industry and its desire to secure by international agreement a standard source of light and to improve photometric methods. Readers will recall that the illuminating power of town gas was regarded as the important characteristic for controlling the quality of gas at this time. The activities of the Commission have extended over the years in a marked degree and it is now a large organisation concerned with the technical aspects of illumination in many fields.

All delegates attended the plenary sessions, at which recommendations of an international character were considered and resolutions passed. In addition, there were no fewer than 39 technical sessions dealing with specialised subjects such as units and standards, definitions, street lighting, store lighting, factory lighting, railway lighting, daylight, colorimetry, photometry, etc.

Royal Interest

The opening session was graced by the presence of the King of Sweden and the Commission was welcomed to Sweden by the Minister of Transport. Over 60 delegates attended from Great Britain, including representatives of most of the Government departments. The gas industry was represented by the following five members of the Joint Lighting Committee of the Institution of Gas Engineers and the Society of British Gas Industries: Mr. F. C. Smith, who was appointed Deputy Leader of the entire British delegation; Mr. P. Crawford Sugg, Leader of the British Gas Delegation; Mr. D. M. Thompson, who represented the Gas Council; Mr. S. F. Baker; and Mr. A. G. Higgins, Assistant Secretary of the Institution.

Many of the technical sessions were of direct interest to members of the gas delegation, and their contributions to the discussions were appreciated by delegates from other countries. The Commission had under consideration whether its activities should be extended into the infra red portion of the spectrum.

One recommendation of considerable academic interest was the proposal to revise the visibility curve for scotopic vision. At the session dealing with street lighting, the British Delegation was led by Mr. F. C. Smith, and Mr. P. Crawford Sugg described the post-war developments in gas street lighting units.

The re-lighting of Bradford Exchange Station by gas was described by Mr. D. M. Thompson, with the aid of slides provided by the courtesy of the North Eastern Gas Board, at a session concerned with lighting practice.

The lighting education session was of great interest and was led for Great Britain by Mr. A. G. Higgins, whose knowledge of the facilities for technical education in this country was appreciated.

While in Stockholm, the gas delegates consulted with their Swedish colleagues in matters relating to the manufacture and distribution of gas and are indebted to the Director, Mr. C. W. Pilo, and the Distributing Engineer, Mr. B. M. Nilsson, of the City of Stockholm gas undertaking, for the facilities placed at their disposal to enable them to inspect the testing laboratories and workshops and to visit district installations.

Tribute is due to the organisation of the Swedish National Committee and to Mr. Ivar Folcker, who did much to make the conference effective.

Concessionary Coal.—Men employed at Derwenthaugh Coke Ovens, Blaydon-on-Tyne, belonging to the National Coal Board, have lifted a ban on overtime while negotiations are opened with the Board concerning the men's claim for concessionary coal allowances. The men claim that they should be included in the agreement whereby employees of the N.C.B. receive an allowance of coal. At present this agreement does not apply to them. Gas from the coke ovens is fed into the Northern Gas Board's system. The Derwenthaugh plant uses about 600,000 tons of coal yearly.

Gas Stock Values

The Minister of Fuel and Power has declared by Order that the values of three more securities have been determined under Part II of the Act, the conversion date being July 16, on which date the securities were extinguished and the holders became instead holders of British Gas 3% Guaranteed Stock, 1990-1995 (issued at par and redeemable at par) calculated in accordance with the rates mentioned below.

Company			Compensation Value
Cheltenham	4% Perp Deb. Stock	£100 unit ...	£103
Gloucester	4% Perp. Deb. Stock	£100 unit ...	£103
Nantlle Vale	Ord. Shares	£1 unit	£5

The values of the following securities having been determined by arbitration, the Minister of Fuel and Power has declared by order that the conversion date was July 19.

Dudley Brierley Hill & District	4½% Perp. Deb. Stock	£100 unit	£113/10/-
Do.	4% Perp. Deb. Stock	£100 unit	£102/15/-
Do.	5% Consol Pref. Stock	£100 unit	£115

In the case of all these securities the Minister has issued a Direction to the Gas Council to pay interest on August 15. The Gas Council proposes to discharge in full to the appropriate holders all outstanding interest accrued to April 30, 1951, on the British Gas Stock issuable by way of compensation.

Gas Film 'Stops the Show'

WHEN the South Western Gas Board put on the Gas Council film 'Method and Madness' in its marquee at the Bath Trades Fair last month it almost literally 'stopped the show'—for other exhibitors protested that it was attracting too many visitors from their stands. The fascia which formed the front entrance to the marquee, was designed by the Board's Northern Divisional Display Department. Here, in addition to the film shows and cookery demonstrations, was a small display of domestic appliances. Colourfully designed in maroon with a red, white, and green awning the exhibit attracted upwards of 2,000 visitors. The enquiry section (shown above) included a photographic display of industrial gas application grouped under six headings—baking, large-scale cooking, heat treatment, steam raising, central and space heating, and miscellaneous. A multi-coloured map of the Bath Sub-Divisional area of supply indicated manufacturing stations, high and low pressure mains, district governors, and proposed extensions.,

A MASTERPIECE OF IMPROVISATION

We pay tribute to the part played by gas fitters up and down the country in the success of the Festival Fare National Cookery Contest.

Fitting up the temporary kitchens in the ballroom of the Park Lane Hotel for the National Final.

While the Festival Fare Cookery Contest has now passed into history, there is one aspect which has not had its full share of publicity, and we return to the contest once again in order to complete the story of the work behind the scenes—the work of the fitters who equipped twelve complete kitchens in the ballroom of a London hotel. It may well be described as a masterpiece of improvisation.

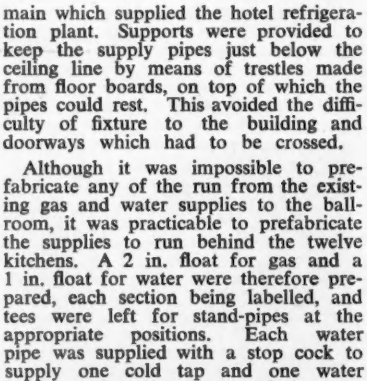
FEW of the 800 guests present on that historic occasion probably realised the tremendous task which confronted the fitters of the North Thames Gas Board when they 'took over' at the Park Lane Hotel only three days (one of which was a Sunday) before the event. It is as a tribute to their magnificent effort, and to that of all those other fitters throughout the country who contributed in like measure to the success of the intermediate stages of the contest, that we published in the following article the full story of their achievement.

Each kitchen was to be provided with a hot water service from a sink water heater, a cold water supply to the kitchen sink unit, gas supply for the water heater and the gas cooker, and a waste pipe from the kitchen sink. All the gas and water supplies for each of the twelve kitchens had to be concealed, and fixing to the fabric of the building was prohibited. There was no gas or water supply in the immediate vicinity of the ballroom, and it was therefore necessary to run 120 ft. of 2 in. supply pipe for gas and about the same length of 1 in. barrel for water.

It proved that the gas supply in the hotel, from which supplies to the ballroom could be taken, was inadequate. To obtain sufficient gas it was necessary to take approximately 40 ft. of existing 2 in. supply and connect to an existing 2½ in. riser on the outlet of the 3,000 ft. meter supplying the hotel. The gas supply to the ballroom was not put on a separate meter.

The water supply was obtained by making connection to a high pressure main which supplied the hotel refrigeration plant. Supports were provided to keep the supply pipes just below the ceiling line by means of trestles made from floor boards, on top of which the pipes could rest. This avoided the difficulty of fixture to the building and doorways which had to be crossed.

Although it was impossible to prefabricate any of the run from the existing gas and water supplies to the ballroom, it was practicable to prefabricate the supplies to run behind the twelve kitchens. A 2 in. float for gas and a 1 in. float for water were therefore prepared, each section being labelled, and tees were left for stand-pipes at the appropriate positions. Each water pipe was supplied with a stop cock to supply one cold tap and one water heater, and each gas stand-pipe was fitted with a union cock to supply one cooker and one water heater. Connections from the water and gas stand-pipes to the kitchens were flexible, the length in each case being approximately 4 ft. This not only permitted tolerance, but made the job of connecting much quicker. Reinforced rubber hose, with Jubilee clips, was used for the gas and ¾ in. soft copper for the water. The fittings used on the copper supplies were of the capillary type and all joints were blown beforehand.



Behind the temporary kitchens in the ballroom of the Park Lane Hotel, showing the gas and water supply lines and the waste pipes connected to each.

It was not known exactly what type of kitchen equipment would be provided, and in particular the size of the sink waste was in doubt, although it was known that this is usually 1½ in. B.S.P. It was, therefore, decided to obtain a supply of reinforced rubber, so that a flexible waste could lead to tanks at the rear of each kitchen. Supply pipes and supports were prefabricated to take the waste to the bottom of each tank, in order to prevent noise.

The stringent time factor imposed upon the work arose from the fact that entry to the premises was not possible until Saturday, July 7, and the work had to be completed by 8 a.m. on Tuesday, July 10. An additional complication was the fact that immediately prior to the delivery of material to the site, it was found that there was insufficient room behind the kitchens to permit observation of the water level in the waste tanks or to allow them to be emptied. It was, therefore, necessary to run an extra float which would take away all the waste water. The time factor did not allow for any of this work to be prefabricated and it had, therefore, to be done on the site. Fortunately, a suitable place was found for connection of the waste into the hotel's existing drainage system.

The manufacturers supplying the equipment for the kitchens were asked to deliver the cookers and water heaters

(Concluded at foot of opposite page)

Gas Supply for the Eisteddfod

Larger of the two holders at Llanrwst undergoing repairs by the Mechanical Engineer's Department, Wales Gas Board.

The battery of high pressure tanks at Llanrwst with a total storage capacity of approximately 21,000 cu. ft.

THE chief event in Wales during the Festival of Britain is the Royal National Eisteddfod. This year it is to be held at Llanrwst (August 6 to 11), a market town and tourist centre in Denbighshire with a population of approximately 2,600. Llanrwst became prominent by its contribution to the housing programme, when the local authority developed the Cae'r Felin housing estate, for which the Architect, Mr. S. Colwyn Foulkes, M.ARCH., F.R.I.B.A., was awarded the Ministry of Health Bronze Medal for the best urban housing scheme in Wales for the period 1945/49.

The population of Llanrwst will be increased many times during the Eisteddfod week and there will be many thousands of daily visitors. It is estimated that 20,000 meals will be served in the official restaurant apart from the existing catering facilities in the town and, to meet these requirements, alterations are being carried out to increase the capacity of the gasworks by some 100%, and to improve the distribution system.

The following figures indicate to some extent the amount of work now in hand:

Population	2,600
Gas consumers	770
Calorific value	425 B.Th.U.
Annual output	19,000,000
Daily gas consumption, August, 1950 ...	50,000 cu. ft./day
Estimated consumption by Eisteddfod caterers, equal to 3,000 cu. ft. per hour maximum	25,000 cu. ft./day
Estimated maximum day consumption during Eisteddfod week ...	110,000 cu. ft.
Existing hourly peak demand	5,000 cu. ft.
Estimated hourly peak demand during Eisteddfod week ...	9,000 cu. ft.
Holder capacities... ...	39,000 cu. ft. 4.3 hours on estimated peak demand.

The official restaurant at the Eisteddfod is to consist of a large marquee 170 ft. by 75 ft. with two smaller ones forming wings on either side each 50 ft. by 30 ft. having a total seating capacity for 1,824 persons. Gas is to be used by the official caterers for all the cooking and hot water requirements, the equipment being provided by the Wales Gas Board. This equipment will consist of the following:—

Three	Large Main D.Y.W. 62/2 double oven ranges.
Nine	25-gal. 'Lune' boilers. (Radiation).
Three	30-gal. Main boiling pans.
Two	No. 3 'Rex' storage sets. (De La Rue).
One	Electrolux L.1000 refrigerator.
Two	Drying cabinets. (Ranalagh).
Four	10-gal. Dean boilers.

It is estimated that the maximum hourly consumption of this equipment is 3,000 cu.ft.

A 4 in. main, approximately 400 yards long taken from the 6 in. main on the Cae'r Felin estate which runs direct from the gasworks, has been specially laid to the site. Pressure tests indicate that it will be necessary for an initial pressure of 10 in. w.g. to be maintained on this main.

The production and storage capacity at the gasworks caused some concern when it was realised that the gas making plant had an effective capacity of 82,000 cu.ft. per day. This plant consists of two beds of six retorts, one bed has been reset and it is anticipated that by more efficient and constant control the production will reach just over 100,000 cu.ft. per day.

With regard to holder capacity, this consists of two water sealed gasholders of 5,000 cu.ft. and 13,000 cu.ft. capacity respectively. There are also 10 small high pressure tanks with a storage capacity of approximately 21,000 cu.ft. which give a total holder storage capacity of 39,000 cu.ft. equivalent to 4.3 hours on estimated peak demand. Owing to the condition of the larger of these two holders considerable repair is in progress.

The preparatory work and final arrangements are being dealt with by the local Manager, Mr. J. D. Rees, with the support of the Colwyn Bay Group under the Chairmanship of Mr. H. Blythe, and of Mr. W. H. Tarn, the Board's Industrial Gas Engineer.

MASTERPIECE OF IMPROVISATION — (*Concluded from previous page*).

to the Board's premises in ample time to permit a thorough test of each appliance. This ensured, before fitting, that all were thoroughly satisfactory.

By arrangement with the hotel authorities, the work of running the necessary gas and water supplies to the ballroom was begun on the morning of Saturday, July 7, and continued until that night. As gas was being used in the hotel at most hours of the day, it was not possible to make the connections to the existing gas supply until midnight on Sunday. Immediately beforehand, work had been recommenced and the supplies to the ballroom completed, most of the gas and water floats behind the kitchens being run.

The firm carrying out the erection of the kitchens began its work on Monday morning, July 9, and between this time and Tuesday morning, July 10, at 8 a.m., the whole of the work of running the supplies and wastes, fixing the gas equipment into position, and connecting the supplies had to be carried out. Kitchen equipment was delivered to the site during the Monday and, as the taps and wastes were supplied loose, these had to be fitted. The remainder of the gas and water appliances were installed, and the 2 in. waste was cut and placed in position, as much fall as possible being provided from the end kitchen to the drain. This waste was fitted to the stand structure, connections from the kitchen wastes being made by 1½ in. reinforced rubber tubes. Floats for the stand were run at floor line, supported off the floor on battens.

In order to complete the work by the scheduled time of 8 a.m. on Tuesday, July 10, it was necessary for work to continue throughout Monday night. During the course of the work no less than 800 ft. of pipe was run. The staff of the North Thames Gas Board who were responsible for this work performed a magnificent job in having the kitchen fittings ready to time and no doubt felt amply rewarded for all their efforts by the splendid condition of the kitchens, their efficient working, and the success of the Final as a whole.

Manchester District Chairman's Day

Members photographed on arrival at Wigan gasworks, with the Mayors of Bolton and Wigan in the centre of the group.

CHAIRMAN'S Day is always a big event for the Manchester and District Section of the Institution of Gas Engineers, and this year, on July 20, about 150 attended the luncheon at Bolton Town Hall given by Mr. D. P. Welman, Chairman of the North Western Gas Board and members of the Board in honour of the Chairman of the Section, Mr. Thos. Haworth. General Manager of the Bolton group, and formerly Gas Engineer and Manager at Wigan. With the Chairman were the Section Vice-Chairmen, Mr. Alex. McDonald and Mr. A. K. Collinge; the immediate Past President, Mr. N. G. Appleyard, and Mr. Alan H. Nicholson, Blackburn, Hon. Secretary, who was responsible for the excellent arrangements.

The Mayor of Bolton, Alderman T. P. Dunning, and the Mayor of Wigan, Councillor J. T. Lynch, were present, as also were Mr. G. E. Currier, O.B.E., Senior Vice-President of the Institution of Gas Engineers and Deputy Chairman of the North Eastern Gas Board, Dr. R. S. Edwards, Chairman of the North Eastern Gas Board, Colonel W. Moncrieff Carr, O.B.E., formerly Chairman of the North Western Board; and Mr. H. Butters, member of the Board.

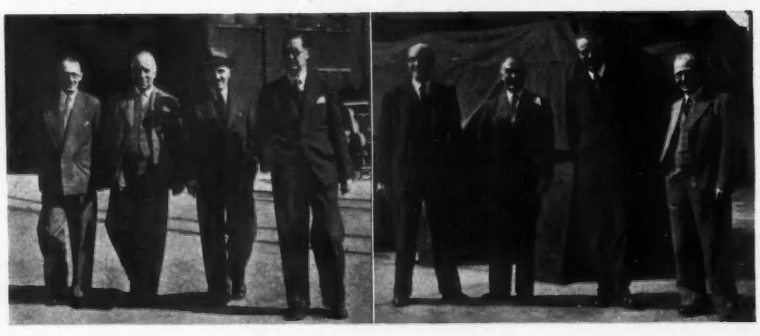
Mr. Welman proposed the toast 'The County Borough and Trades of Bolton, and Guests,' and began by welcoming the Manchester and District, or perhaps should he say, the Lancashire and Yorkshire Section. He also extended a welcome to the Mayor and Town Clerk of Bolton and the Mayor and Town Clerk of Wigan. He thought they would have to be very dull-witted indeed if they did not appreciate how keen the wrench was to the local authorities when they had torn from them one of their greatest and most cherished assets. But once the inevitable had occurred and those units of gas production plant were knitted together under the various area boards, he thought it was a grand thing to feel that their loss was the national gain.

Mr. Welman proceeded to refer to the subject of coal, observing that the position at the moment could not be described as anything less than extremely dangerous. Figures for the North Western Board were, he believed, indicative of the general coal position throughout all areas, to a lesser or greater degree. They were 67,000 tons short of their current programme, and were currently short of their percentage deliveries month by month; and then could they believe that the position in the coal industry was such that they would be able to catch up on current delivery figures between now and October. He thought they would agree that they could not catch up. They had to face a serious coal back-log in a matter of a few weeks. In this area, unless they were able to improve their position very considerably over the target percentage between now and October, the position would be a serious one. For if they succeeded in maintaining their present level of supply only, they would start the winter with over 200,000 tons short of their essential winter stock.

MR. D. P. WELMAN'S COAL WARNING

If they had not the coal to keep supplies going through the winter, clearly they would require more coke. The coal position not only provided them with an additional difficulty in producing for sale sufficient coke to be anything like adequate for the demand they knew they would have to face. In their area last winter they started with a stock of 217,000 tons; this winter stocks would be negligible. Last winter they could not meet the normal demand. If coke supplies were to be controlled effectively throughout the country then they must be directly controlled by those who produced the coke.

Referring to the question of training and education, Mr. Welman said that there might possibly be the impression that movement in the matter was too slow, and he would agree that they were moving too slowly, but, he added: 'Unfortunately, unless we are to build up massive top-heavy headquarters organisations, we have to take our steps steadily and soundly, putting first things first, and trying our best to get round as fast as we can to those things which are not perhaps vital to this particular hour but are important for to-morrow. Whatever we may be able to do at this stage, before we are able to introduce any far-reaching schemes we have to face the serious shortage of effective and fully-qualified lecturers at all technical colleges. It is no use trying to educate our younger men through the medium of young and semi-experienced lecturers, however keen these may be. We need for the training of our young men the best possible lecturers with the best experience. And I would urge upon any of you who can to offer his services and his experience, technical and otherwise, to the technical colleges in his district.



Left to right.—N. Hudson, G. E. Currier, J. Drake, H. Johnston, R. L. Greaves, T. D. Olver, J. Wilson, and R. J. Bradshaw.

The Immediate Past-President (N. G. Appleyard), the Chairman (T. Haworth), and the Hon. Secretary (A. H. Nicholson).

and see how far he can give, individually, the help that is needed in this difficult matter.'

He had often said, on the subject of management, that no man could manage unless he was given the full power to do so. But they have to remember, on this subject of autonomy, that when they considered it sound to integrate into areas and through the medium of groups, or divisions, or whatever might be the case, as units of production plant, they must not stop when at area level. They had to knit effectively and workably, the 12 areas together under the Gas Council. And he believed the time would come when they would look at this picture much more nationally but without losing for one moment the authority which they had under the Act to manage their own affairs.

'I believe,' continued Mr. Welman, 'that this industry has the finest basic personnel throughout its organisation of any industry with which I have been in contact. I have been staggered at the first-class quality and the loyalty of the people who serve us in our works. We have a great future, but we are suffering to a great extent from that much abused word 'frustration' from which the nation as a whole seemed to be suffering. But the people in the industry, like the people in the country, are basically sound; they have lost nothing of their old courage and tenacity—it is only temporarily smothered. We can, I believe, expect the 'guts' of this country to come to the service of the country, by the method, and the only method, of first-class 'leadership.' One of the most important things we have to do is to see to it that the quality of our leadership throughout our organisation, right from the bottom to the top, is of the very best.

Alderman J. T. Dunning, J.P., Mayor of Bolton, in response, appealed to all gas undertakings not to cause the sewage manager too much difficulty with gas liquor effluents.

A Good Start

Dr. R. S. Edwards, replying for the guests, said they had made a good start with the nationalised industry. He had said two years ago that the new set-up would result in increasing demand for gas engineers, and increasing opportunity for gas engineers—those trained in the gas industry who were prepared to specialise in aspects of the industry. He believed already that the shape of things to come was showing clearly; and he was delighted to hear of the plans that were being made for increasing educational opportunity.

Mr. G. E. Currier proposed the toast of 'The Institution of Gas Engineers, Manchester and District Section.' He referred to the fact that he was representing the President of the Institution, Mr. Dyde, who was extremely disappointed not to be present, but was looking forward to coming to one of their meetings during his term of office. He did send cordial greetings and best wishes to Mr. Haworth and the members on that occasion. He would prefer to speak, said Mr. Currier, for himself, as representing the Institution, and as a Past President of the Section. There was no doubt that the change to district sections had resulted in higher status for the sections, as they were now part and parcel of a Chartered Institution. And in these sections they had a good training ground for the higher executive appointments in the industry. The leadership to which Mr. Welman had referred meant being able to get the best out of everyone they were leading and controlling, in the best way. It also meant that they had to create an urge in everyone to have a pride in his job.

Mr. Currier suggested the Committee might use one session for the discussion of selected papers which had already been presented at the Institution meetings in June and November each year, some of which did not always receive the attention which they deserved.

Mr. Haworth responded to the toast, expressing thanks on behalf of the Section to the North Western Gas Board for the spontaneity of their hospitality, and to the Mayor and Town Clerk of Bolton for the assistance and co-operation. He also spoke in appreciation of the mayors, aldermen, councillors, town clerks, borough treasurers, and many others who had worked with him over the last 30 years.

The party then proceeded to Wigan, where an inspection was made of the Wigan gas undertaking.

Tea was served in the Wigan Town Hall, after which the proceedings terminated with a vote of thanks to the hosts, the Mayor and Corporation of Wigan, proposed by Mr. H. Butters, and responded to by the Mayor of Wigan.

Scottish Gas Board Projects

THE Scottish Gas Board has sanctioned the expenditure of more than £325,000 in the past three months, it was reported in Edinburgh on July 18 at a meeting of the Scottish Gas Consultative Council. The share of the Glasgow and West Division was more than £132,500, including more than £42,000 to be spent on Dawsholm gasworks. Totals for other divisions were: Aberdeen and North £30,676, South West Scotland £20,477, Central £103,088, Edinburgh £22,702, and South East Scotland £17,323. Mr. A. T. Morrison, Chairman, said the Board had appointed a sub-committee to recommend the most suitable standard calorific value.

Included in the summary of projects approved was the construction of a 100,000 cu.ft. spiral guided gasholder in steel tank for the Turriff district at an estimated cost of £11,076. Work is expected to be undertaken between 1952 and 1954. Another item, estimated to cost £18,500 and to be undertaken between 1951 and 1953, was the extension in Aberdeen and district of gas mains, etc., to supply 1,306 houses, at Mastrick housing scheme.

In the Central Division, the Board has approved the resheeting of No. 4 gasholder in the Dundee district at an estimated cost of £17,347 between 1952 and 1953, and an extension of Blairgowrie main by a 6-in. main to Alyth, estimated to cost £22,600, and work was expected to be undertaken in 1953-54.

Projects in Glasgow include the formation of foundations for a gasholder and oil storage tank at Dawsholm works, and repairs and installation, at a cost of £23,100; retubing of condensers at Provan works and other items to cost £10,660; and installation of electricity, and painting and decoration at the Central showrooms, to cost £6,094. Projects in Dumbarton and Helensburgh district total £24,485, and £19,397 in the Renfrewshire group.

Tar and Ammonia Activities in 1950

More Tar Distilled in Fewer Works

THE report for 1950 of the Chief Inspectors of Alkali, &c., Works—the 87th of the series—records that the number of works in England and Wales registered under the Alkali, &c., Works Regulation Act was 977, involving the operation of 1,775 processes, an inrease of eight works and 34 processes over the previous year. The increases were due mainly to the coming into force of a new order under which five new works and 45 processes were registered. There was a substantial fall in the number of benzene, tar, and sulphate of ammonia processes and an increase in gas liquor and chemical manure processes. A high rate of production was maintained in the chemical industry, but the recovery of benzole at gasworks was limited by the overriding necessity of maintaining the volume and calorific value of gas supplies. Export of pitch was somewhat reduced, with a resulting accumulation of stocks.

Coke ovens were worked to capacity, but the operation of a number of old batteries was becoming uneconomic. It was in fact necessary to shut down some of them; on the other hand a substantial number of new installations are in course of construction. Mention is made of the National Coal Board's new battery at Nantgarw and the renewal of existing ovens and extensions thereto on the same site, as well as the new ovens at Margam erected by the Steel Company of Wales, Ltd. The putting into service at the end of September of the coke ovens at the East Greenwich works of the South Eastern Gas Board is also placed on record.

Operation of plants for the production of concentrated ammonia liquor and of liquor ammonia was reasonably satisfactory although there were the usual difficulties in connection with severe corrosion, choking of pipelines, etc. As usual also there was cause for dissatisfaction regarding the condition of plants, but only two were deemed to be sufficiently serious to class as infractions. Referring to sulphate of ammonia works the inspectors state that there were a number of cases where it was necessary to call attention to failure to use 'best practicable means' as required by the Act.

There was a further fall in the number of tar works registered from 175 to 162 consequent on the continuing tendency to concentrate tar distillation at large central installations. Replacement of discontinuous pot stills by continuous units, often of large throughput, continued. Such replacement is welcome as the potential nuisance value is considerably less.

Operation of continuous stills involves a hazard which is often insufficiently appreciated, consequent on the presence of hydrogen suphide dissolved in the light oil, a circumstance which resulted in a fatality at one factory where an operator adjusting a ball valve leaned over a light oil receiver tank with his face close to an opened manhole and collapsed with his face inside the tank and with nose and mouth below the level of the light oil. The immediate cause of death was benzole poisoning, but tests showed that the atmosphere of the tank contained a high concentration of hydrogen sulphide and it was possible that the man's initial collapse was due to inhalation of this gas.

On the whole tar plants were operated satisfactorily, but there were the usual and apparently inevitable causes for dissatisfaction.

The figures summarised in the tables are abstracted from the report, copies of which are obtainable from the Stationery Office, price 1s. 9d. net.

Production of sulphate of ammonia (tons) at registered works in Scotland was as follows:

Liquor	1950	1949
Gasworks	7,900	10,300
Coke Ovens ...	12,400	12,300
Shale Works ...	17,600	17,500

The report of the Chief Inspector for Scotland states that the number of works on the register decreased from 80 to 79, due to the closing down of a small bisulphite works. Processes at the 79 registered works numbered 117, a net decrease of three. One by-product sulphate of ammonia plant stopped during the year and was converted to an ammonia concentration plant. There are now only two plants in Scotland making sulphate of ammonia from by-product ammonia from gasworks. Most of this ammonia goes to waste apart from a small usage for other purposes. An investigation of this waste in conjunction with the Scottish Council (Development and Industry) was continued. The possible use of by-product ammonia either directly or indirectly as a nitrogen fertiliser appeared to be the most promising. Industrial interest showed signs of increasing and one firm was known to be considering afresh what use it might make of by-product ammonia. Manufacture of concentrated by-product ammonia was carried out on a restricted scale and the few plants in operation were worked in accordance with the provisions of the Act.

There are, says the report, a few small tar works on the register which seem unlikely to operate again. Tar distillation is now carried out almost entirely at a few large centres. There were no complaints about those works. A complaint was received about tar and pitch fumes from an unregistered works, but on investigation it was found to come from a process outside the provisions of the Act.

AMMONIA

Tons. Produced at Registered Works and Government Factories

From	Salts of Ammonia expressed as 25 % NH_3		Concentrated Ammonia calculated to 25 % Strength	
	England and Wales	Scotland	England and Wales	Scotland
Liquor ex Gasworks	101,500	8,700	61,400	3,940
Liquor ex Coke Ovens	186,600	12,700	23,100	300
Liquor ex Shale Works	—	17,940	—	—
Synthetic Processes	923,900	10,940	1,391,200	169,860
TOTAL	1,212,000	50,280	1,475,700	174,100

NOTE: Much of the concentrated liquor was subsequently converted to salts. The total of salts plus concentrate is therefore greater than the net production of ammonia.

TAR DISTILLED AND PITCH PRODUCED—*Tons*

	England and Wales		Scotland	
	1950	1949	1950	1949
Tar distilled originating at:—				
Gasworks	1,386,600	1,375,100	193,510	179,180
Coke Ovens	839,400	828,300	44,810	45,930
Other Works	62,800*	51,100	1,830	1,680
Total Tar distilled ...	2,288,800	2,254,500	240,150	226,790
Distilled or dehydrated to refined tar	556,800	553,800	83,540	67,130
Distilled to pitch	1,732,000	1,700,700	156,610	159,660
Gross pitch production	932,700	916,500	74,230	75,450
Pitch oiled back	386,700	328,500	21,400	20,530

* Includes carburetted water gas tar produced at gasworks.

PRODUCTION OF SULPHURIC ACID

Tons. Calculated to 100% strength

Excluding Government plants except those producing for trade purposes.

	England and Wales		Scotland	
	1950	1949	1950	1949
Production	1,570,000	1,419,000	206,000	217,000
Proportion of plant in use % ...	92·7	93·7	81·5	86·5
Proportion made %				
in chamber plant	34·3	39·9	58·8	58·5
in contact plant	65·7	60·1	41·2	41·5
Raw Materials Used				
Pyrites	126,000	142,000	68,000	70,000
Sulphur and H_2S	318,000	265,000	37,000	41,000
Spent Oxide	181,000	180,000	11,000	10,000
Zinc Ores	176,000	156,000	—	—
Anhydrite	185,000	179,000	—	—

SPORTS AT REDCAR

At the prize-giving ceremony. Left to right: Mrs. Pallister, Mr. J. W. Pallister, Mrs. Bradshaw, Mrs. Allison, Mr. J. R. Bradshaw (Deputy Chairman, Northern Gas Board), and Mr. H. P. Allison.

The first annual sports day of the Middlesbrough division of the Northern Gas Board was held at the Redcar racecourse and was attended by approximately 450 of the employees and their wives and children. The meeting was organised by representatives from the various sports clubs attached to each unit. This sports day is the first of its kind to be held in the whole of the area of the Northern Gas Board. The complete success of the meeting was such as to exceed the most optimistic expectations of the organisers. The prizes were presented by Mr. J. R. Bradshaw, J.P., Deputy Chairman of the Board, and also present were, Mrs. Bradshaw, Mr. John W. Pallister, Divisional General Manager, and Mrs. Pallister, Mr. Stanley Jones, Engineer and Manager of the Western section, Mr. H. P. Allison, Engineer and Manager of the Eastern section and Mrs. Allison, Mr. J. R. Cleator, Manager of the South Bank unit and Mrs. Cleator, Mr. G. Hamilton, Manager of the Skinningrove unit and Mrs. Hamilton, and Councillor G. F. Andrew, a member of the Consumer Committee. A silver cup suitably engraved was presented by Mr. Pallister for competition, and this cup will be awarded annually to the unit winning the largest number of points in the field events. On this occasion the trophy was won by the Middlesbrough unit.

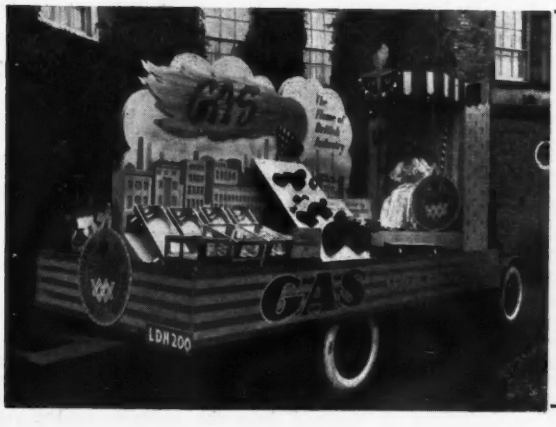
Compensation Amendment

The Minister of Fuel and Power has made, and Parliament has approved, the Gas (Staff Compensation) (Amendment) Regulations, 1951 (Statutory Instrument No. 1327, Stationery Office, 2d. net), making a modification of the original regulations in respect of certain inspectors of meters and gas examiners. The Order was made on July 21 and came into operation on July 22.

The Gas (Staff Compensation) Regulations, 1949, provide in Part IV for the payment of compensation by the Minister of Fuel and Power to certain persons employed before vesting date as inspectors of meters and gas examiners.

Under the regulations there are (subject to limitations as to entitlement) three categories of compensation payable—*viz.*, immediate (usually for the first three months after loss of employment), substantive (generally up to the date when the claimant reaches retiring age) and residual (after the claimant has attained retiring age). Under reg. 18, inspectors and examiners entitled to compensation for loss of employment are only entitled to residual compensation if they have suffered loss of employment and pension rights.

Certain of the inspectors employed before vesting date by Justices of the Peace were not subject to any superannuation fund. The new regulations amend reg. 18, and entitle such inspectors to be awarded residual compensation where it was likely that their employment would have continued after the normal retiring age. The right conferred is the same as that conferred in corresponding circumstances on the employees of gas undertakers by Part II of the regulations.



In the carnival processions at Smethwick, Coventry, Kings Norton and Hereford, the West Midlands Gas Board's lorries made a bright showing. This vehicle won second prize at Smethwick and first prize at Kings Norton.

National Benzole Association

At the 22nd annual general meeting of the National Benzole Association at Wellington House, Buckingham Gate, S.W.1 on July 11, Sir Edgar Sylvester, K.B.E., was re-elected President.

The Executive Committee is as follows: H. H. Bates, Lieut.-Col. P. F. Benton Jones, O.B.E., Dr. T. H. Butler, Colonel W. M. Carr, C.B.E., E. Crowther, C.B.E., G. A. Hebden, A. W. Lee, C. Lord, T. A. McKenna, Sir William McGilvray, C.B.E., M. Milne-Watson, Leslie O'Connor, C.B.E., S. J. L. Robinson, M. H. Rollason, Major A. G. Saunders, L. Shuttleworth, Colonel H. C. Smith, C.B.E., D.L., H. E. Sugden, R. C. Todhunter, and W. M. Valon, together with A. Hittinger, Chairman, and R. J. Smith, Director and General Manager of the National Benzole Company, Ltd. The Secretary is W. E. Cartwright.

North Thames Gas Sales

The following statistics relating to gas sales (in therms) in the groups represented by divisional committees for the March, 1951, quarter were submitted to the North Thames Gas Consultative Council on July 26:

Berks. and Bucks. group: Domestic, 3,639,883 (=66.5%); non - domestic, 1,775,888 (=32.5%); public street lighting, 52,870 (=1.0%); total, 5,468,641.

Middlesex and Surrey group: Domestic, 21,415,117 (=65.7%); non-domestic, 10,597,210 (=32.5%); public street lighting, 608,119 (=1.8%); total, 32,620,446.

Metropolitan group: Domestic, 25,762,008 (=48.3%); non-domestic, 26,681,539 (=50.0%); public street lighting, 873,794 (=1.7%); total, 53,317,341.

Essex group: Domestic, 16,234,435 (=69.3%); non - domestic, 6,908,208 (=29.6%); public street lighting, 255,617 (=1.1%); total, 23,398,260.

Area totals: Domestic, 67,051,443 (=58.4%); non-domestic, 45,962,845 (=40.0%); public street lighting, 1,790,400 (=1.6%); total, 114,804,688.

Gas Industry in France

Our Own Correspondent extracts from the French Technical Press a selection of current developments in the gas industry across the Channel.

FOLLOWING recent publications in the United States, Prof. Alfred Gillet of Liège sums up, in a paper reported in the May *Chimie et Industrie*, research relative to the action of solvents on coal and the chemical structure of the latter. He is convinced that rapid progress in this field is to be expected. In his view the method of controlled oxidation is likely to be the most fruitful in these researches. Is it possible, he asks, to visualise a coal molecule? It has been said, even recently, that coal is a complex mixture of substances which differ in their molecular weight and in their structure. If, however, in their celebrated researches in the extraction of coal by solvents, Wheeler and his collaborators had been able to use phenanthrene (boiling at 340°C.) instead of pyridene (B.P.115°) as primary solvent, it is not 30% of the coal which they would have extracted, in the form of constituents β and γ, but 80 to 90%; and this product can be at once precipitated and re-dissolved at will. Perhaps they would have then concluded, as Prof. Gillet himself has done after his tests with anthracene oil, that coal is a substance much more homogeneous than is generally believed. Perhaps they would have called this fraction of 80%—as he did—the fundamental substance of coal, and considered this fundamental substance as a 'substance unitaire,' at any rate until we know more about it.

Action of Solvents on Coal

Verifying work just published by Messrs. Golumbic, Orchin and other research workers of the Bureau of Mines, Pittsburgh, on this action of phenanthrene on coal the following results emerge:—

One can dissolve very rapidly, at high temperatures, in certain very active solvents—phenanthrene at about 350°C., naphtol at about 290°—more than 80% of a rich coal, which fraction will be called the fundamental coal substance.

This fundamental substance exhibits many of the characteristics of a true molecular unit; the constant manner in which it passes into solution and separates out from the solvent, without alteration of composition, without marked tendency to fractionation, its behaviour in fusion and even in distillation and oxidation, its aptitude to crystallisation.

But this substance decomposes very easily and it is the products of this decomposition which early researchers have separated by the solvents which they employed, giving rise to this concept of the 'very complex mixture' so firmly established in current thought.

Gillet and his associates recognise in their solution of coal the effects of the same decomposition as that of which Wheeler's school had collected the products: the dissolution of the coal in anthracene oil is transient, as its fusion is. What is re-precipitated spontaneously, after having been entrained in the complex which it forms with other bodies, would be the insoluble humine of Fischer, the fraction of Wheeler. The practical difference between the two classes of solvents, the progress which is achieved by the use of high temperature solvents, is to render possible the dissolution of the humine. The constitution of these bodies is still to be investigated and the problem is far from being solved. Professor Gillet's present opinion is that the method of controlled oxidation offers the most promising route to the knowledge of the constitution of coal. He proposes to develop this subject in a future paper.

The May issue of the *Journal des Usines à Gaz* marks the 75th anniversary of the first appearance of our French contemporary in May, 1877. The Editor traces its life since that date. In its early days there was competition, resulting in absorptions and amalgamations until the *Journal* emerged as the sole organ of the gas industry in France, the mouthpiece of the Association Technique. It emerged from the painful but temporary eclipse of the Occupation into the fine organ we see today. We wish to add ours to the felicitations and congratulations which have been showered upon 'The French Journal' from all sides, at home and abroad.

'Gas Week'

Some 450 gas engineers from all the regions attended 'La Semaine Gazière' in Paris in April. It was opened in the presence of M. Bertier, Administrateur de Gaz de France, M. Reclus, Hon. President of Gaz de France and President of the Société pour le Developpement de l'Industrie du Gaz en France, M. Leclers, Directeur de l'Exploitation, M. Mougin, Directeur de l'Equipement, Professor Ribaud, Directeur of Research and M. Biard, President of the Association Technique (the equivalent of our Institution) who presented the first paper, 'Impressions of a visit of inspection to America' during which he represented the French Association Technique at the Congress of the American Gas Association last October. Other papers covered the subjects of welding in metallic structures, distribution networks development and maintenance, competition in industrial and commercial uses of gas, water heating in industrial and commercial use, organisation and maintenance in the gasworks, the use of infra-red analysis in gas research and new techniques in gasification (by M. Tixier, a re-statement of his well-known work on complete gasification and the production of oil-gas). Among the visits was that to the Vierzon works where the new complete gasification (coal) plant was among the chief exhibits. The architecture of the building in which this plant is housed (a photograph is beautifully reproduced in the *Journal*) is a fine example of modern industrial design.

The Gas Congress, which includes the annual meeting of the Association Technique du Gaz, was held at La Baule, June 18-23. No fewer than 39 papers were presented. Only the titles are yet published. The Congress should have been held at Nantes, but owing to the paucity of hotel accommodation in that city, La Baule, a famous Breton seaside resort, was preferred. Commenting on the proceedings the Editor remarks that the directors of the coal and steel industries chose this ocasion to give the results of their interesting experiments in the possibilities of coking the Lorraine coals. These results show that it is possible to produce excellent coke with coal hitherto regarded as unsuitable by means of blending and compressing the charge, even drying it in some cases. The cracking of natural gas and that of the derivatives of petroleum (propane, heavy oil) is giving rise to important developments in the use of these materials for peak load gas. The use of a wide range of gases for domestic and industrial application is facilitated by the employment of M. Delbourg's new test burner which takes account not only of calorific value and density but of a certain 'combustion potential' which may become known as the 'Delbourg Index,' a function of composition and density.

Infra-red Drying

In the June issue, too, is reported a comprehensive paper by Professor Ribaud and M. A. Donesco (of Gas Research) on 'Absorption of Infra-red Radiation by different substances in the Liquid State.' The efficacy of drying in a radiation chamber, that is to say, the rapidity as well as the quality of the operation (the absence of blisters, local over-heating, etc.) depends upon the manner in which the substances treated absorb the radiations in the infra-red. The penetration of the different infra-red radiations into different paints and their solvents has been very little studied. For practical applications it would appear indispensable to obtain definite figures to determine the efficacy of different radiation sources at different temperatures. The Research Department therefore set out to make some measurements, limited to the paints most commonly used, in infra-red drying appliances. To these are added measurements on liquid water for which the interpretation of data hitherto available does not always give immediate results.

The work is set out in detail with results exhibited in a number of graphs. Measurements of spectra of emission and transmission were made in a Beckman infra-red spectrograph equipped with a prism of fluoride of lithium for wavelengths between visibility and 6μ, and of rock salt for the region between 6 and 15μ, using a Nernst lamp at constant temperature.

The results reported showed that radiation at low temperatures, that is with a preponderance of long wavelengths, far from having a lower efficiency in drying than radiation at high temperatures, seem on the contrary to present over the latter a certain number of advantages in the following cases: (a) In drying by elimination of the water impregnating tissues, pasty or vegetable, permitting, with equal energy, a superficial evaporation more intense than with higher temperatures; (b) in drying paints with relatively slow evaporation of the solvent on the surface, without excessive heating of the latter and with good penetration in the deeper layers. The results have shown, too, that in the case of paint, the solvent comes only slightly into the absorption; the pigment plays the essential rôle because of its absorption in the border between visibility and the infra-red. This last remark gives the explanation of the fact that in paints, the absorption of radiation increases when the temperature of the radiating source rises.

Oil-cracking in Coke Ovens

M. A. Siron, Chief Engineer at the Brussels Gasworks, describes oil cracking in an empty coke oven, with results notable in these days when many works are facing increased demands upon inadequate or outworn plant. This process was tried out in a battery dating from 1929. The oven selected was out of shape and had given difficulty in discharging. Its demolition had been decided upon.

As in most of the Belgian coke oven plants the first trial was with charging a mixture of fuel oil and coal. The results obtained compared favourably with those of other works, but they give no great increase in output. It was decided to try direct injection into the heated empty oven. The injector and feeding arrangements are described. In the first trial oil was injected at one side only at a point something less than one-third of the height (780 in 2,700 mm) from the bottom. Almost immediately encouraging results were obtained, but after several hours the walls were covered with a layer of 'soot' and after some days the accumulation was such as to impede operation. It was decided to add a second injector at the other side of the battery. The difficulty was at once removed. Some small deposits continued mainly just below the injectors, but in the main the chamber remained completely free. Cleaning once a week, removing two or three barrow loads from the bottom of the oven with a daily cleaning of the orifices was sufficient to keep the operation going.

The fuel was an ordinary light fuel oil injected with steam. Production was estimated by observing the increase in total output from the bench, and the overall result was that more than three times the quantity of gas was produced in this oven compared with the production of coal gas. Contrary to expectations the expenditure of underfiring fuel to crack one kg of oil was less than that required to carbonise a kg of coal. After two years working the silica walls of the oven showed no trace of attack.

It is concluded that oil cracking in the empty coke oven is an extremely simple industrial process which permits a gas-making coke oven plant provided with suitable means of dilution to augment considerably its output for a negligible capital expenditure.

The Painting of Gasholders

M. Veillon returns to his subject of the æsthetic combination of colours in the painting of gasholders. He notes that gasholders are seldom isolated, but generally erected in groups of two, three, or more. Colouring should, therefore, be considered from the point of view of the whole group. He had previously called attention to the use of different colours for different parts of the single holder, tank, bells, guiding, structural work, etc., in which the use of contrast diminishes the effects of the whole on the landscape. This principle is carried a step further by the employment of a different predominant colour for each of the holders in a group. Grey, green, yellow, brown (but not black) may be used each in different shades. In each particular case the colouring of the different elements of surroundings, ground, vegetation, structures, roofs, etc., must be considered and the combination of colourings selected accordingly. In three examples of groups of three holders the colours from front to back might be (1) beige, green, grey; (2) yellow, brown, grey; (3) green, chamois, yellow. Such combinations should make a notable contribution to the solution of the problem of the æsthetic of the gasholder.

The whole subject of industrial architecture was discussed in a one-day session of the Institute of Industrial Aesthetics. M. Georges Combet, Directeur General du Gaz de France, repeated the treatment of the very controversial problem of the relations between æsthetics and industry, which we reported in abstract last year. In an analysis of the factors entering into the design and construction of industrial plant, M. Combet developed his conception of an industrial architecture which should take into consideration the three problems of composition, of construction and of economy, and he again urged the need for collaboration of architect and engineer in the very early stages of design.

NEW BRITISH STANDARD

The British Standards Institution has recently published B.S.1740:1951, 'Wrought pipe fittings, iron and steel (screwed B.S.P. thread),' which provides for an extensive range of fittings, screwed British Standard pipe thread, for use with wrought steel and wrought iron pipes and includes for the convenience of users particulars of equal sockets, hexagonal backnuts and barrel nipples as specified in B.S.788 and B.S.1387. Two standard weights of fittings are provided, namely, light weight and heavy weight, except where otherwise shown. It covers welded and seamless wrought steel and wrought iron tubes to B.S.788. Pressure tests are prescribed. An appendix is included covering a mechanical expansion test on the fittings. Copies may be obtained from 24, Victoria Street, London, S.W.1 (5s. post free).

CONTROL OF SCARCE METALS

Three measures to control the use of scarce metals have been announced by the Chancellor of the Exchequer. First, allocation schemes are being prepared for iron and steel (other than sheet steel and tinplate, which are already subject to allocation) for introduction as soon as possible and corresponding measures to regulate the distribution of the more important of the scarce non-ferrous metals will also be worked out. Secondly, since it will take some time to get these schemes introduced and working effectively, certain interim measures will be brought into operation so as to safeguard the defence programme meanwhile. Third, not only the defence programme, but various categories of civilian production must be safeguarded while the allocation schemes are being worked out. These categories include dollar and sterling area exports and the fuel and power programmes, which remain as important as ever. Proposals are, therefore, being worked out whereby sponsoring departments will be able to claim preferential treatment for specific orders for goods for which iron, steel (other than those already allocated), and copper, zinc, and their alloys are required, subject to a strict limit on the amount qualifying for such preferential treatment in any particular period.

RAW MATERIAL RESEARCH

Addressing a conference between the Advisory Council for Scientific and Industrial Research and the chairmen and directors of industrial and nationalised research associations, Mr. G. R. Strauss, Minister of Supply, said research into raw materials was one of the most important problems of the day. Most materials were scarce; the needs of rearmament coming on top of a high level of industrial activity had led to demands which had in many cases outstripped the available resources, a situation which might continue for some years to come. For this reason, research associations must undertake research into new methods of conserving raw materials and try to evolve new specifications employing smaller quantities of raw materials without any lowering of essential quality. The problem of economy in the use of metals was one which concerned the Minister of Supply and he had appointed Mr. D. A. Oliver as Metals Economy Adviser.

Oxide Purification of

MIXED COAL GAS : WATER GAS STREAMS

by
GAS CHEMIST

WHERE a gas undertaking distributes a town supply consisting essentially of a mixture of coal gas and carburetted water gas (a state of affairs which is almost universally prevalent in this country), the question of the purification from H_2S of the component gases resolves itself primarily into considerations as to whether the crude coal gas and water gas shall be purified separately or as a mixed stream. The obvious and outstanding advantages of combined purification are, of course, the lower capital costs of oxide purifiers, and, to a lesser degree, their lower maintenance and labour charges per therm of gas. In spite of these considerations, however, the combined system has very serious drawbacks, which, when set against the advantages, may well turn the scale in favour of separate purification. The subject may be regarded from two viewpoints—the technical features of the process itself, and the effects of the system employed on the scientific control of the manufacturing processes. This latter point is often overlooked, but its effect may be very great. Unfortunately, it is difficult to assess its value accurately on a financial balance-sheet.

Considering the details of the process itself, one of the first points to be settled is where the junction of the two streams shall be located. This should be as near to the oxide purifiers as is practicable, and should in any case be at such a position that all tar has been removed from both gas streams.

The components of carburetted water gas tar and coal tar are capable of reacting, when mixed, with the formation of a black jelly-like deposit which tends to block-up pipes, promotes emulsification, and becomes a general nuisance on the gasworks, besides making the tar unacceptable to the distillers. For this reason, no mixing of the two types of tar should be permitted in any part of the works plant.

Tar Fog Nuisance

Many works, particularly the smaller ones, are not equipped with electro-detarrers at the inlet of the oxide boxes. Where these are not installed, the nuisance of tar fog, if not actually present, must always be regarded as potential. Tar or oil fog passing to the purifiers, will form a protective coating over the oxide particles and thereby greatly hinder the absorption of H_2S, especially in the first taker, which acts largely as a tar scrubber. In like manner revivification, whether *in situ* or external, is greatly slowed up.

Since the washing and scrubbing plant in the coal gas stream is usually more extensive than in the carburetted water gas stream, and the tar is of such a nature that it is more easily deposited in the run-offs, it is generally found that in the absence of a detarrer the gas at the inlet to the oxide boxes contains considerably more oil mist with carburetted water gas than with coal gas. This is particularly the case with highly enriched water gas and in cases where there is under-cracking of the oil.

General experience shows that purifiers which are used solely for carburetted water gas become inactive much sooner than those used solely for coal gas, even though the former gas may contain a relatively lower proportion of H_2S. The oxide in the former case is found to be rendered largely inactive by reason of the oil film around the particles. Where the two gases are purified together, most of the oxide has, in the majority of cases, to deal with the coal gas and only a relatively small proportion with the water gas. The oil particles from the latter, however, are often present in sufficient amount to affect adversely the whole of the oxide. With separate purifiers for coal gas and water gas there will be only a relatively small amount of oxide which is affected in this manner.

Where all traces of tar fog have been removed by electro-detarrers, this does not, of course, apply, and in such circumstances a stronger case can be made out for combined purification. Apart from considerations of capital and maintenance costs there are some instances in which combined purification has proved of advantage on account of the fact that water gas often contains small quantities of oxides of sulphur, derived from the coke used in the generator. This leads to the production of sulphurous and sulphuric acids which are known to have inhibiting effects on the purification reactions. If, however, coal gas is being simultaneously treated, the traces of ammonia which are usually present will neutralise the acidity arising from this source, and keep the oxide in the slightly alkaline condition which favours efficient purification. It is open to question, however, whether it is not better practice to purify separately and to ensure alkalinity of the water gas by passing a regulated proportion of the latter, as a by-pass stream, over strong ammoniacal liquor containing free ammonia in a tank or washer, or, alternatively, to admit a very small amount of crude coal gas, taken from the inlet of the ammonia scrubbers, into the water gas stream.

The greatest disadvantage of mixed purification, however, lies in the limits which such a system imposes on scientific control of the separate processes of manufacture. It is impossible to exercise full control over any chemical process without a full knowledge of relevant quantities, and such knowledge is bound to be imperfect where there is mixing of products into a common stream. To determine separate yields of coal gas and carburetted water gas per unit of plant and per unit of raw material it is essential to be able to measure the volumes and determine the calorific values of the individual gases, preferably in their purified condition. In many works the only station meter is positioned on the common purified stream and can give no information about the volumes of individual gases passing through it.

Metering Difficulties

To know these volumes it will be necessary to have meters on the separate streams of crude gas, and this introduces serious difficulties. The more accurate kinds of meter, as, for example, the wet drum type, cannot be used unless constructed of non-corrodible material, and this is costly, difficult to obtain, and difficult to work with. The employment of meters of the orifice type is an attempt at a solution, but while going part of the way towards solving the problem, does not yield altogether reliable results, since variations in temperature, specific gravity, and other factors may affect the measurements considerably. It is doubtful whether really reliable computations of thermal yields can be obtained by their use. Where gas volumes are measured crude, corrections have to be applied to convert to purified volumes, and such adjustments are often of doubtful accuracy. They involve knowledge of H_2S content, air volumes to purifiers for revivification, amount of oxygen absorbed in purifiers, etc. Where it is necessary to determine separate calorific values, these will have to be determined on samples of component gases from which H_2S has been removed in small test apparatus. This may introduce errors due to the scrubbing effect of oxide, etc., which may give results differing somewhat from what would apply to large scale purification practice.

These and similar considerations combine to make it very difficult to apply that precise degree of control which is essential to the efficient working of the processes under consideration.

In making plans for the installation of new plant, therefore, it is well to give most careful consideration to the question of separate or combined purification. Admitting the saving in capital and maintenance costs by the latter scheme, it is by no means certain that it will be the best long term policy.

TREATMENT AND DISPOSAL OF GASWORKS EFFLUENTS*

By DR. A. MARSDEN,

Area Scientist, South Western Gas Board.

(*Continued from p. 240*).

THE effects of toxic substances are increased at low oxygen concentrations. Clear evidence of this, in the case of two poisons—namely, potassium cyanide and para-cresol—has been quoted by Southgate.[25] For a given concentration of cyanide the toxicity was four times as great with a concentration of 50% oxygen saturation as with 90% saturation. Approximately the same relationship was found for *p*-cresol.

Theoretically there are three methods by which the undesirable effects of polluting substances can be prevented.[26]

(1) By destroying the forms of life responsible for them—*i.e.*, by sterilisation. It must not be concluded, however, that if liquor is sterilised before discharge to the river it will cause no trouble. Such procedure would not necessarily avoid pollution because bacteria are present in the river itself.
(2) By separating the oxidisable substances from the sewage before admitting it to a stream or river.
(3) By allowing the reactions to take place under controlled conditions before discharging the sewage to a river or stream.

In Great Britain a combination of methods (2) and (3) is usually employed. After removing detritus from the sewage and allowing the coarser suspended particles to deposit by settlement, further purification may be obtained by one or more of the following:—

(a) Land filtration.
(b) Biological filtration in bacteria beds.
(c) Activated sludge.

In land filtration the sewage is applied to agricultural land and, while it is perhaps the oldest method of disposal, its use is restricted because it needs more land than is usually available. Modern processes seek to accomplish the result on a smaller ground area and in a shorter time.

The bacteria bed system consists essentially of a series of percolating filters, usually about 6 ft. deep, containing some suitable medium, such as clinker, granite, or hard coke, on which the bacteria and other organisms develop as a gelatinous film. Sewage leaving the settling tanks is distributed over these filters by means of revolving sprinklers. Aerobic action is continuous and the objectionable constituents of the sewage are oxidised. The effluent, apart from a flocculent humus sludge which is settled out, should be clear and fit to enter stream or river.

During recent years a great deal of work has been done on the development of systems of biological filtration of sewage in which filter effluent (usually after treatment in a humus tank) is pumped back and mixed with the settled sewage, the mixture then being applied to the filter. The effect of this system of recirculation of effluent is, of course, that liquid containing a relatively low concentration of organic matter is passed through the filter at a relatively high rate. The idea is an old one. For example, it was used by Fowler in 1904 in the treatment of gas liquor, and in 1935-38 the Water Pollution Research Laboratory adopted the same principle in the treatment of waste waters from the milk industry.

The object in adopting a system of recirculation for treatment of sewage is to increase the net rate at which the sewage can be treated in a filter of a given size, and this saving in capital cost must be balanced against the cost of pumping and the increased costs of humus tanks, distributors, and other equipment.

The activated sludge method has the advantage of requiring less space than the percolation process, but more power is required to run the plant and in general the system is more sensitive to conditions. Preliminary treatment is the same as in the case of biological filtration and, on leaving the settling tanks, the sewage is mixed with 10%-15% of activated sludge and is then agitated and aerated continuously when rapid flocculation and oxidation occur. After leaving the aeration tanks the sludge is allowed to settle and part of it is used to activate further sewage. It may require 'conditioning' aeration in the absence of sewage before use.

Sewage sludge from the settling tanks can be dried on open beds and used as a fertiliser, although there is an increasing tendency to treat it by anaerobic fermentation, when considerable amounts of methane are produced and the remaining sludge is less offensive and easier to dry.

These brief descriptions are given with the idea of emphasising that the principle of biological treatment of sewage is essentially oxidation. Ordinary domestic sewage contains within itself, as pointed out by Key,[27] all the agents necessary for its purification, with the exception of oxygen, and, given sufficient time and air, will purify itself completely—as it does, for instance, in a river if the dilution is great enough. The problem thus consists in the effect of the constituents of liquor or effluent upon the oxygen requirements of the sewage with which it may be mixed and also the possible effects upon the bacterial and other life involved in the oxidation and other processes. The oxygen requirements of the principal constituents of liquor and their speed of oxidation are shown in Table 5.

TABLE 5

Constituent	Toxicity	Oxygen Absorption O/A*	Rate of Biochemical Oxidation	Remarks
Free ammonia	high	*nil*	Very slow	* In comparison with these figures it may be noted that the O/A for domestic sewage varies from (say) 5 to 15 p.p. 100,000.
Fixed ammonia	*nil*	*nil*	Very slow	
Sulphide	high	1345	Fast	
Cyanide	high	600	Very slow	
Thiosulphate	low	856	Fast	
Phenol	medium	1780	Fast	
Higher tar acids	low	high	Very slow	

Concerning the requirements of the Rivers Pollution Prevention Act, it may be noted that the two deciding factors of the quality of a sewage effluent, other than the possible presence of toxic bodies, are (1) the amount of suspended solids present, and (2) the amount of dissolved oxygen which the sample is capable of abstracting from tapwater, after suitable dilution, on incubation five days at 18°C.—*i.e.*, the B.O.D.

After careful deliberation the Royal Commission on Sewage Disposal, in its eighth Report, recommended that the former should not exceed three parts and the latter two parts per 100,000 of effluent.

As Badger [28] points out, the object of the standard was to ensure that no river or stream, after addition of the effluent, should have a B.O.D. exceeding the 0.4 part per 100,000. Obviously the volume and purity of the water into which the effluent is discharged must be taken into account, and this is probably the reason why such a general standard has never been legalised, although it is often quoted.

In normal townships there is usually close relationship between the dry-weather sewage flow and the crude liquor make,

* From a paper to the South Western Section, Institution of Gas Engineers, May 16, 1951.

the latter being approximately 0.25% of the sewage, and long experience has shown that such a ratio does not cause undue loading of the filter beds. With an activated sludge plant 0.5% volume of gas liquor was treatable, whereas 2% of liquor, besides increasing the load fourfold, also slowed down the oxidising power of the activated sludge, apparently due to the toxic bodies in the gas liquor.

It has been stated that the proportion of gas liquor treatable on bacterial filters may be greater than 2%, although there is little information available on this point.

Investigations carried out at the Stivichall sewage disposal works, Coventry, on the treatment by biological filtration of sewage containing spent liquor indicated that when the proportion of spent liquor added to the settled sewage was increased from 0.25% to 0.50% volume, then at the higher figure the average values for B.O.D. and for O/A were increased by about 50%.

The percentage of liquor acceptable by a sewage authority also depends on the proportion of other industrial effluents present in the sewage.

With the proposed integration schemes, the tendency will be to disturb the ratio of liquor to sewage because many areas supplied by given gas undertakings will increase and so cease to be coincidental with the drainage area on which the gasworks is situated. This will, no doubt, result in considerable discussion and the need for adjustment of treatment costs.

Experiments on the behaviour of the separate constituents of spent liquor have shown that 'fixed' ammonia may, or may not, be completely oxidised, depending upon the sewage plant capacity.

If incomplete, the quality of the effluent will be reduced on account of its increased oxygen demand; phenols are very readily oxidised, while higher tar acids and thiocyanate are the most difficult to treat.

Other Methods of Disposal

This heading may be further sub-divided for purposes of convenience into:—(1) Untreated into tidal rivers, estuaries, etc.; (2) as a fertiliser on the land; (3) in C.W.G. plant washboxes; (4) by evaporation; (5) coke quenching; (6) percolation into sub-soil.

(1) *Untreated into tidal rivers, estuaries, etc.*—Direct discharge into surface waters, such as streams, rivers, and lakes, is not usually permitted on account of the polluting and toxic nature of the liquor. Phenols and higher tar acids (H.T.A.) are particularly undesirable in water which is to be used as a source of domestic supply because, when chlorinated, these substances impart an unpleasant taste to the water even when they are present in very minute concentrations.

When the disposal of untreated crude liquor is justified on the grounds of economics, the cases fall into two main groups:

(a) Works situated some distance inland, and
(b) Works in immediate proximity to the sea.

The South Western Gas Board may, perhaps, be considered fortunate in having so many of its works close to, or upon, tidal rivers, but even so there are a number of conditions which must be fulfilled if trouble is to be avoided.

This so-called method of disposal by dilution was considered by the Royal Commission on Sewage Disposal and, in its 8th Report, the opinion was expressed that where the quantity of water into which the sewage is discharged is such that the latter is diluted at least 500 times, the sewage can be discharged without previous purification. In such cases the oxidation which occurs subsequent to the discharge does not cause the dissolved oxygen content to fall to a dangerously low level.

It must be remembered, however, that even in estuaries or near to the sea where the volume of water is enormously greater than that of the sewage, there is the risk of locally high concentrations due to incomplete mixing, and it is not uncommon for river banks or the foreshore to become objectionable. For that reason, and also to protect the rights of riparian owners, there is an increasing tendency to install sewage treatment plants.

Even if thorough mixing of effluent with large volume of water is achieved, great care must be taken to eliminate tar and oily matter. For this purpose a number of units in the South West have installed simple filters which are capable of easy control and renewal. Such a filter, installed in duplicate permits easy operations and supervision.

(2) *As a fertiliser on the land.*—Ammoniacal liquor has been shown to be a useful nitrogenous fertiliser[29] if applied to the land at a suitable time and in correct dosage, so that where a works is so situated that the liquor, as such, can be used locally without heavy transport charges this may provide a mutually satisfactory outlet.

Considerable work has been carried out, particularly in Germany, on the use of gas liquor as a fertiliser and, in a very full report issued by the Institution of Gas Engineers[30] it was shown that ammoniacal liquor is an effective fertiliser so long as care is taken in its use. It was also shown by Key and Etheridge[31] that when first applied to grass it caused severe scorching, although a fertilising effect almost equivalent to that of sulphate occurred later. The liquor also exercised a toxic effect when in contact with seeds, so that if used in agriculture it would presumably have to be applied well before the seeds were sown, or in such a way that it did not come into contact with them. These authors attributed the toxic effect to thiocyanate.

Crude concentrated ammoniacal liquor was also found to be effective and much less toxic than ordinary ammoniacal liquor. It was also suggested that the liquor could, perhaps, be very conveniently used for composting straw to yield a product similar to farmyard manure, but so far as is known there is no detailed information on this point.

Considerable work was also done in Denmark, and through the kindness of the Ministry of Agriculture and Fisheries I have obtained a report from the Dane who has been experimenting for about 15 years. He claims to have obtained excellent results with cabbage, fruit trees, strawberries, turnips, carrots, beets, potatoes, and grass. It was also found that for rye and wheat the crude ammoniacal liquor must be applied as early as possible before sowing. In some of the experiments the crude ammoniacal liquor was diluted with three parts of water.

It is also of interest to note that small scale field trials were made by the Tottenham Gas Company, using market garden crops, potatoes, and grassland, and the result showed that ammoniacal liquor can be used as a fertiliser if certain precautions are observed, while at the same time some disadvantages were noticed. For instance, it was suggested that the land must be allowed to rest for five to six weeks before planting or sowing. Such poisoning and souring of the land was stated to be due to hydrogen sulphide, and that concentrated liquor free from hydrogen sulphite produced practically no souring, although of course its cost is much higher. It was also stated that liquor destroys clover in grassland in two seasons, and encourages the growth of coarse unpalatable grass. The work ended at Tottenham because it was an urban area, and there was difficulty in spraying the soft soil, but during the last 15 years there have been big advances in spraying machines of all kinds. In June of last year an article appeared in the *Farmers' Weekly*[32] referring to the experiments carried out by a Lincolnshire farmer during a period of 18 months and suggesting that ammoniacal liquor might be used as a fertiliser. The farm comprises 120 acres of grassland and 120 acres of arable land, and carries 25 cows in milk, together with the usual young stock. Since using crude liquor the farmer dispensed with all nitrogen fertiliser, but is applying, in addition to the liquor, 4-6 cwt. superphosphate and 1 cwt. potash per acre, together with ordinary farmyard manure. The crude liquor was used with success on land which grew oats, wheat, barley, sugar beet, potatoes, and other root crops.

Up to 1,500 gal. of crude liquor per acre have been used on grass and silage crops. Grazing fields were treated alternately with liquor and then grazed. It was noticed that some young beasts out in a field and being fed with hay and roots were grazing on a field which had been treated with liquor 24 hours previously, and they did not come to any harm.

This farm was visited in company with technical members of the Advisory Staff of the Ministry of Agriculture, when the above statements were confirmed, and no detrimental effect on stock had been noticed. The liquor used was 6 oz. to 7 oz. strength produced in continuous vertical retorts. It was applied neat at rates varying from 500 to 1,000 gal. per acre, with an average rate of 700 gal. per acre over the whole farm.

The method of application adopted on arable land was to give 300 to 400 gal. per acre after the crop was off and before ploughing, followed by a similar quantity in early spring after the seeds were through, with a further dressing if considered desirable.

Experience has shown that potatoes should not be sprayed in dry weather. Any crops bruised by the wheels of the sprayer are, of course, liable to be damaged, therefore the widest possible spraying boom should be used.

As is well known, the continued use of sulphate of ammonia on land brings about the lack of calcium by base exchange. Any such loss brought about by crude liquor is likely to be comparatively slight because most of the ammonia is not combined with inorganic anions. The particular farm in question is on Lower Lias limestone, and so the effect is not a problem. The liquor was not entirely free from traces of oily matter, but this has not yet caused any trouble. There was only one sterile patch where the spraying cart had accidentally flooded the soil with liquor.

There has been much discussion, and many contradictory results in the past in regard to the use of crude liquor as a fertiliser, but the general impression gained from the Lincolnshire experiments was that while crude liquor was likely to be advantageous for farmers as a cheap source of nitrogen, experimental work was necessary, particularly on different geological formations and in areas of higher rainfall.

One disadvantage of the work done so far is the lack of control plots for comparison purposes, and fairly long term experiments are needed to settle the question as to whether continuous use of crude liquor on land alters the microbiological flora sufficiently to allow the build-up of toxic materials to levels which will cause damage to plants. One would expect that if reasonable doses are used at fairly wide intervals the soil fungi and bacteria will be unable to deal with the thiocyanates and phenols, but direct evidence on this is needed over a range of soils, and with a number of liquors of varying composition.

It is hoped that some experimental work to settle this point will be put in hand soon in the South West.

(3) *C.W.G. plant wash-boxes.*—At two large works in the South Western area 280,000 gal. of crude liquor were disposed of during a period of approximately eight months by passing through the four wash-boxes of four C.W.G. sets. The results were quite satisfactory, but care had to be taken to feed the liquor and wash-box through separate inlets, otherwise the precipitation of calcium carbonate caused trouble, because the water was very hard.

(4) *Evaporation.*—It is suggested that resort should be had to this method only when no better alternative presents itself. It is apt to be expensive and may cause trouble due to corrosion and aerial pollution. Successful attempts have been made in the South West to dispose of both crude liquor and still effluent by means of evaporation. For example, during a period of about eight months in 1931 550,000 gal. of crude liquor were treated by evaporation in trays installed in the main flues of horizontal settings. Between 60% and 70% evaporation was obtained, and the residual liquid passed away with the works drainage. The outlet liquid from the trays was free from hydrogen sulphide and the 'free' ammonia was reduced by about 80%. No excess air was admitted to the chimney base in any case. The chief objection was the high maintenance costs of the trays.

In the case of still effluent, evaporation on racks heated by exhaust steam, supplemented when necessary by live steam, was tried but abandoned on account of expense. It has, however, been found possible to dispose of the still effluent equivalent to about 15 gal. per ton of coal carbonised on the grates of producers supplying horizontal retort settings.

(5) *Coke quenching.*—Both crude liquor and still effluent have been tried for this purpose, and both were rejected because of complaints from consumers that there was an objectionable odour from the coke. In some cases the coke assumed a dull and uninteresting appearance.

(6) *Percolation into sub-soil or 'soak-aways.'*—This expedient is not recommended, although special claims may be put forward when certain cases have been considered on their merits. It should be remembered that the disposal of effluents by percolation into the sub-soil is restricted by the obligation neither to cause a public nuisance nor to interfere with the rights of other landowners. It has been held that a landowner has no right to use his land in such a way as to pollute percolating underground water which is drawn into the well of a neighbouring landowner. If he disposes of material on his own land, he must take care not to let it escape on to that belonging to his neighbour, and not to pollute the air which reaches that land.[28]

The percolation method of disposal, particularly when applied to crude liquor, whether deliberate or due to accidental leakage, may result in a long term problem. Pollution from such a source may persist for a considerable time, even after the cessation of gas-making, because it has to be remembered that one is looking only for a few parts per million of a substance and seepage into a relatively small volume of ground can result, under certain conditions, in pollution which is very difficult to trace and deal with, since it varies with the changing level of the water table. The dangers which may arise from percolation and seepage are also mentioned by Wedgwood (c.f. 'Water Pollution,' pp. 9-10, paper to the London and Southern Section, Institution of Gas Engineers, January 30, 1951.)

Legal Position

At this stage of the paper the author dealt with the essential legal points relating to effluent disposal as distinct from the technical procedures involved. [Owing to exigencies of space we can only give a few points from this section.—Ed. *G.J.*]

The definition of a stream in the Rivers Pollution Prevention Act, 1876, is as follows:—

'"Stream" includes the sea to such extent, and tidal waters to such point, as may after local enquiry and on sanitary grounds be determined by the Local Government Board (now the Ministry of Health) by Order published in the *London Gazette*. Save as aforesaid, it includes rivers, streams, canals, lakes, and watercourses, other than watercourses at the passing of this Act, mainly used as sewers and emptying directly into the sea, or tidal waters which have not been determined to be streams within the meaning of this Act by such Order as aforesaid.'

It will be seen that this definition is very wide. A river board shall have the right to obtain and take away samples of any effluent which is passing from any land or vessel into any river, stream, watercourse or inland water in the river board area. The conditions under which the evidence shall be admissible in legal actions, and the procedure for taking samples, are the same as in the Public Health (Drainage of Trade Premises) Act.

The following important points are made in the report by the Ministry of Health on the Prevention of River Pollution (1949). It is stated that the position is, with few exceptions, that tidal waters of rivers and the sea have never been subject to the provisions of the Act (Rivers Pollution Prevention Act, 1876) and the result is that in the majority of cases sewage, or liquid industrial effluents, are being discharged to tidal waters without any permission at all.

The term 'tidal waters' is not defined in the Act of 1876, and these very real difficulties make it impracticable to suggest an automatic extension of the law to tidal waters. On the other hand, the present position whereby the Minister can extend it only on sanitary grounds is too restrictive.

In Section 20 of the Act of 1876 the term 'pollution' does not include noxious discoloration. Pollution is, of course, often accompanied by discoloration and abatement of the one will often remove the other. However, it is quite possible for traces of particular matter not present in sufficient quantity to justify proceedings for pollution, to cause considerable discoloration, and that in some circumstances the removal of such traces would prove a difficult technical problem.

Economic Aspects

As stated previously, this paper is essentially a review, and one has to avoid, as far as possible, the pitfalls of posing a number of problems without giving any answers. In this particular case of effluent disposal, while many of the answers are difficult, it is possible to make suggestions which, if put to the test, may be found to provide some of the answers.

One point to which too much emphasis cannot be given is the necessity for the gas industry and the sewage authorities to co-operate to the full, otherwise the disposal of effluents in the most economical manner, and to the satisfaction of all concerned, will never be possible. In any case, it should be remembered that the costs involved become a charge upon the public either in the form of an increase in the price of gas or as an increase in the rates.

It has been suggested elsewhere[34] that the disposal of untreated crude ammoniacal liquor from large carbonising units is wrong from a national point of view, and that in such cases steps should be taken to recover at least the 'free' ammonia. At the same time, of course, the sulphur, occurring as sulphide, would also be recovered.

Incidentally, if the following assumptions are made, namely:—

(a) Coal carbonised by the gas industry in Great Britain during 1948 = 24.5 mill. tons (this ignores the coke ovens which carbonised over 22 mill. tons).
(b) Average 'make' of 10 oz. liquor per ton of coal = 25 gal.
(c) Average H_2S content of the liquor = 0.3% w/v, then the amount of 100% sulphur available from this source alone would be, in round figures:—
7,700 tons per annum.

It is realised that the sulphur is already recovered in those cases where the liquor is treated but, in view of the present sulphur position, the figure is of interest.

The case of small units is different, and conditions may be such that ammonia recovery is quite uneconomical, but even so steps may have to be taken to avoid pollution. However, in many cases the disposal of the crude ammoniacal liquor will be a short-term policy because integration will result in the closing down of such units.

The chief headings under which the important question of economics may be discussed are as follows:—

(1) Sulphate of ammonia manufacture.
(2) Production of Crude Concentrated Ammoniacal Liquor.
(3) Dephenolation.
(4) Other Processes.
(5) Disposal of effluent via sewage works.

Sulphate of Ammonia Manufacture.—In 1939 it was reported to the Institution[35] that 'Twenty years ago the revenue derived by the three Metropolitan Gas Companies from the manufacture of sulphate of ammonia and ammoniacal liquor was equivalent to a contribution of 2s. 9d. per ton of coal carbonised. With the advent and development of the manufacture of synthetic ammonia, there was a notable overproduction, with the result that the accounts of the three companies showed a deficit, in 1932, equivalent to 0.48d. per ton of coal carbonised.'

There is not, therefore, much money to be made at gasworks by the manufacture of sulphate of ammonia, but where plants exist and have been written off, it is well to note that Wilson and Wells[36] consider that one way of lowering the production cost is to recover hydrogen sulphide in a form most suitable for the manufacture of sulphuric acid.

Whether sulphate of ammonia or crude concentrated ammoniacal liquor is to be made, it cannot be emphasised too strongly that the strength of the crude liquor should be kept as high, and its volume as low, as possible, because if present-day costs[37] of sulphate manufacture are taken at £9 19s. per ton, on an annual output of 1,500 tons, a selling price of £11 per ton shows a small profit which, however, can be quickly dissipated if the liquor strength is halved, or if exhaust steam is not available. In the manufacturing costs, 10s. per ton is allowed for sundries, and so may include some charge for effluent disposal[38].

Production of Crude Concentrated Ammoniacal Liquor.—The position of C.C.A.L. is not fundamentally different from that of sulphate of ammonia, when viewed economically, because the price per unit of ammonia paid for C.C.A.L. is linked with that of sulphate.

In both cases the value of the 'fixed' ammonia recovered seldom results in a profit, and may easily show a loss so that, as already noted, it is not difficult to see why the recovery of ammonia, either as sulphate or as C.C.A.L., has not been adopted as standard practice, because, for any particular case, the potential revenue is too easily absorbed by capital, labour, and steam costs, and by maintenance.

However, the manufacture of C.C.A.L. particularly at small and medium sized units, where the plant could be home-made[39], may assist in some cases in the centralised economic recovery of ammonia.

Dephenolation.—This procedure represents an attempt to produce an effluent which is relatively easy, and cheaper, to treat at the sewage works, or one whose toxicity is so reduced that it can be disposed of safely in other ways. For example, dephenolised liquor from the Partington gasworks is discharged into the Manchester Ship Canal.

Although phenol is very easily oxidised under the conditions at a sewage works, it is particularly toxic to fish. It has been shown that 0.6-0.7 p.p. 100,000 of phenol is toxic to trout, while 10 p.p. 100,000 of ammonium thiocyanate were not toxic in one hour.

The various processes for carrying out dephenolation are linked closely with the question of hot-gas detarring, because the latter increases the amount of recoverable phenols and that is a factor of great importance in the economics of dephenolation. Hot gas detarring is suitable where the tar is sufficiently low in viscosity to flow away readily from the precipitator, such as with gas from continuous vertical retorts, but in some cases it may be too thick, and also, if condensation follows hot detarring, there may be difficulty due to naphthalene deposits when carbonising certain kinds of coal.

While dephenolation may assist in producing a satisfactory effluent, it has to be remembered that the capital cost is high and the process rather complicated, although, apart from ammonia, phenols are probably the only constituents of crude liquor likely to be extracted at a profit[40]. Richardson[41] stated that 'a plant capable of dealing with the crude liquor produced from a gasworks carbonising 600 tons of coal per day would at the present time (November, 1949) cost at least £24,000, while treatment might cost 8s. per 1,000 gal. The sum of £24,000 is approximately that for a C.V.R. installation for 300,000 cu.ft. per day, so that the cost of the dephenolating plant is too heavy for the work it performs. In addition, there is the nature and value of the recovered phenols. When separated from the solvent by distillation their quality is often poor and they may contain, say, 7% pitch and over 10% neutral oils. For this reason a dephenolating plant in which tar acids are removed from the solvent by treatment with caustic soda, followed by carbonation, seems to be a better financial proposition, because the recovered phenols would be worth more in the market.'

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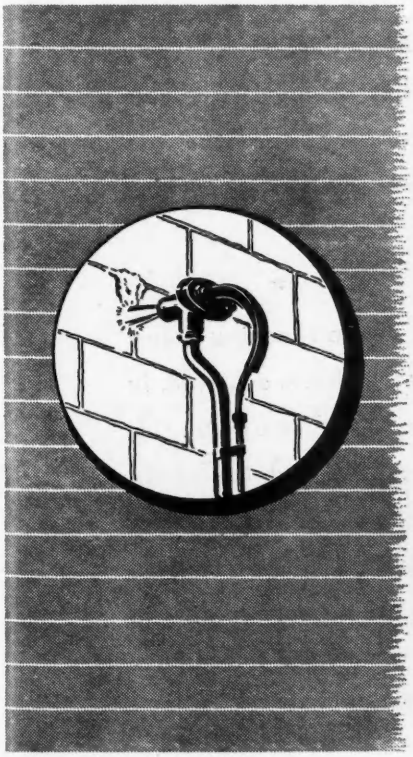

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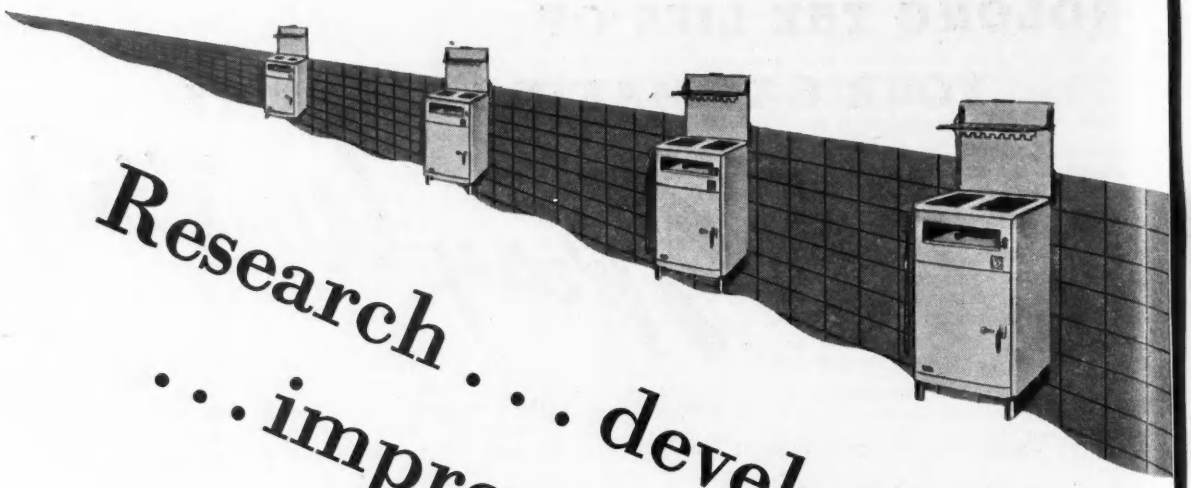

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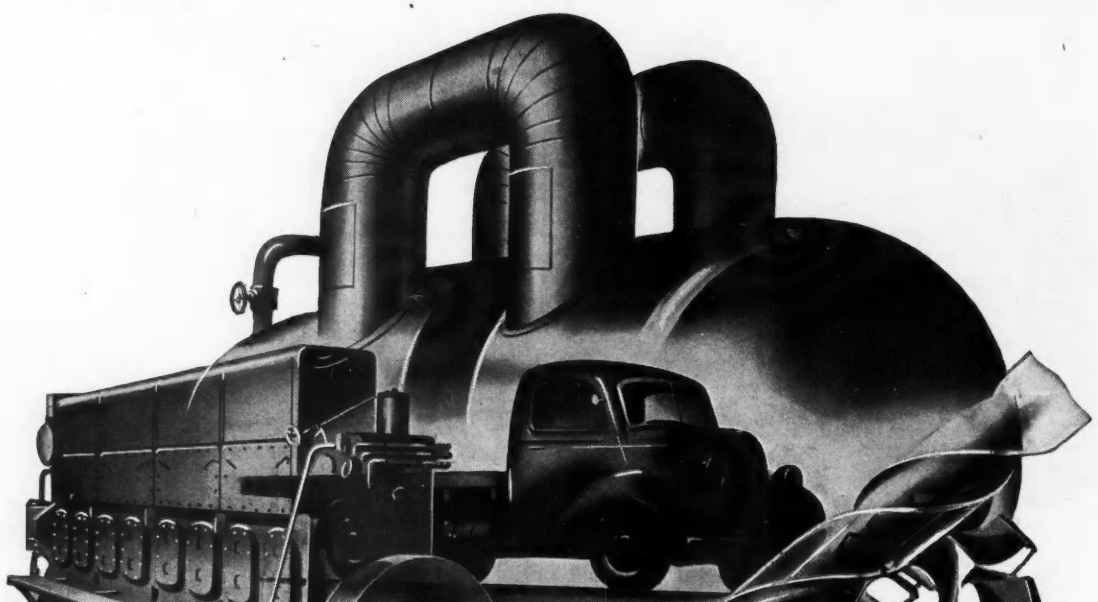

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However, it is possible that in some cases local conditions of effluent disposal may be the deciding factor rather than economics, because the basis of a sewage authority's charge may be such that it pays to dephenolate, taking into account the value of the phenols.

Other Processes.—Although descriptions have been published on various occasions, no apology is offered for referring here to the special case of Tingley, near Leeds, because a new gasworks having a capacity of 14 mill. cu.ft. per day from I.V.C. is being constructed there and the volume of the effluent produced will be out of all proportion to the dry weather flow of the local sewage. An elaborate scheme was, therefore, worked out, consisting essentially of four stages[42, 43], namely:—

(a) Dephenolation of crude ammoniacal liquor by means of benzole.
(b) Removal of 'free' ammonia and hydrogen sulphide in a C.C.A.L. plant.
(c) The still effluent from the C.C.A.L. plant vacuum evaporated to 15% of its original volume and the concentrate washed with butyl acetate for the removal of the polyhydric phenols (H.T.A.), the washed residue being further concentrated for the recovery of crystallised ammonium chloride.
(d) The remaining liquids from the above stages passed through an active carbon plant for the complete removal of phenolic bodies.

The capital cost of the plant is high, being of the order of £12,000 per mill. cu.ft. of gas per day, and the process will be watched with great interest from the economic angle.

Disposal of Effluent via Sewage Works.—Apart from elaborate processes, such as the one devised for Tingley, it can be assumed that no practicable way has yet been discovered of purifying gas liquor, and the only feasible method is to pass the liquor into the public sewers so that it can be treated with the sewage at a sewage purification works[44]. Wherever possible, crude ammoniacal liquor should be excluded because not only is spent liquor purified with greater ease, but at least a part of the valuable substances, such as ammonia, sulphur, and phenols, can be recovered rather than money spent on destroying them at sewage works.

Some sewage works having reserve capacity can treat 0.5% of spent liquor, but others—and they are in the majority—find difficulty in doing so. For various reasons, among them being neglect due to the war and growth of population, many sewage works are inefficient or overloaded so that, when negotiating payment for effluents it is necessary to see that any proportion of capital charges involved represents only that due to the effluent.

During the discussion on Badger's paper, Dr. Jenkins observed 'there was no doubt that a good many sewage works in the country were grossly overloaded owing to the fact that not a penny had been spent on them in 10 years. Also it was hardly likely, in the present circumstances that much money was going to be spent on sewage purification works. Unfortunately, the drainage districts in which the sewage works existed were likely to receive increasing amounts of gas liquor.'

If crude liquor must be accepted, it is recommended[46] that not more than 0.25% be admitted. It is, however, generally accepted that if the population served by the gas undertaking is comparable with the area draining to the sewage works, then the treatment of the liquor with the sewage does not present too difficult a problem, provided the flow of liquor is regulated to suit the purification plant[46].

This is confirmed by the experience in West Bromwich where, since January, 1946, crude gas liquor has been discharged into the sewers, under controlled conditions, to the extent of 0.11% of the dry weather flow of crude sewage. The crude liquor, of approximately 8 oz. strength, raised the O/A by 3 p.p. 100,000, but did not retard biological treatment to an unsatisfactory extent.

Dr. Butcher[47] is of opinion that the disposal of liquor and effluents is essentially a biological problem, and that biologists may have to be called in. There was, he thought, heavy emphasis on the O/A of the liquor and little emphasis on the toxic side. There was much work to be done to determine whether a particular effluent contained substances toxic to the various bacteria. Pollution was a biological and not a chemical one, because the standard of pollution in the end was one of what the effluent did to the biological life—*e.g.*, bacteria in filters and fish in rivers.

One of the main necessities is for greater uniformity in the methods upon which charges are based. It is known that the lack of uniformity is due mainly to inadequate information on the effect of the various constituents of gas liquor on sewage purification, and also upon the varying standards of purity required, as well as to the differing attitudes of local authorities concerning payment.

At the present time some gasworks pay on the volume of liquor produced, some on the tonnage of coal carbonised, some pay a fixed annual charge, while others claim a prescriptive right to discharge liquor without payment. This last view, of course, applies only to volumes and compositions lawfully discharged during the period March 4, 1936, to March 3, 1937, subject to compliance with the requirements of any local by-law or agreement in force at that time.

It is generally agreed that a convenient way of expressing the proportion of gas liquor in sewage is on a percentage by volume basis, although it is obviously advisable to reduce the 'oxygen load' by any convenient form of pre-treatment, such as distillation, dephenolation, or oxidation. The first two have already been noticed but, for the third, a method which is still under investigation consists in the oxidation of spent liquor by electrolysis, using plates coated with lead dioxide as the anode and the metallic electrolytic tank as the cathode. During the experiments, a large amount of froth formed during the electrolysis and the liquid darkened in colour, but after several hours a dark coloured solid was precipitated and the liquid became lighter in colour. In one experiment seven hours electrolysis reduced the O/A of spent liquor from 770 to 46 p.p. 100,000.

It is, of course, well known that the higher tar acids cause the greatest difficulty at sewage works, particularly due to frothing and colour.

Various authorities have pointed out that so far no definite conclusion has been reached on the important matter of the best method for assessing the cost of treatment of crude and spent liquors at sewage works. Badger[48] has observed that a working rule for payment for trade effluents, which seems to be accepted by many sewage authorities is the 'Townend' formula. It was based on the actual cost in 1938 of the treatment of sewage at the Mogden works, and for that reason it is also known as the West Middlesex formula.

The cost of treatment per 1,000 gal. is given as:—

$$1 + \frac{S}{60} + \frac{M}{75} \text{ pence}$$

where S = Suspended solids expressed in p.p. 100,000.
M = The McGowan strength of the trade effluent, after removal of the suspended solids, settled out during two hours quiescent settlement.

The initial 1d. is for pumping.

The McGowan[49] strength = 4 hours O/A from $\frac{N}{8}KMnO_4$ at 26.7°C. in p.p. 100,000 × 6.5 + total nitrogen in p.p. 100,000 × 4.5.

At the time it was put forward, the Townend formula was based on 25s. per ton of oxygen absorbed plus 30s. per ton of suspended solids, plus 1d. per 1,000 gal. for pumping.

It has been found very suitable for assessing the cost of most trade effluents in the West Middlesex area, but it was recognised quite early that it was not wholly applicable to gas liquor because certain constituents, unlike sewage, were readily oxidised and in some cases almost completely during the four hours of the permanganate O/A test. At the present time, in the absence of reliable data on the bacterial treatment of the individual constituents of gas liquor and spent liquor, probably the best procedure available for assessing the loading on filter beds was the 'oxygen absorption.'

According to the general figures[50] for O/A in four hours, crude gas liquor is about 100 times stronger than domestic, but by the B.O.D. test it may be only 10 or 20 times as strong.

Clifford[51], dealing with Birmingham gas liquor in an experimental plant, arrived at a figure of 0.45d. per lb. of O/A loading, or 7s. 5d. per 1,000 gal. of liquor having an O/A of 2,000 p.p. 1,000, but Dr. Jenkins[52] queried the figure of 0.45d. and suggested that present-day costs would increase it to not less than 1d. per lb.

In any case, the cost of treatment cannot be evaluated without detailed consideration of such matters as local conditions, sewage strength, and condition of plant.

Concerning the behaviour of the different constituents of gas liquor during purification under controlled conditions, the Birmingham Drainage Board[53] has undertaken investigations which it is hoped will give a lead to the gas industry as to the value of removing certain constituents before the liquor enters the sewers. The West Midlands Gas Board has also set up an Effluents Panel with executive powers, and the Panel is working with the Committee of the Institute of Sewage Purification on present and future problems.

It would seem, therefore, that at present the oxygen loading forms the best basis of assessment, but as more facts come to light some modification in the system of charging may become necessary. Therefore, any agreements which are negotiated should include a clause providing for the revision of the basis of charging after a period of, say, three years.

Thoughts for the Future

This paper has proved somewhat difficult to prepare because, as stated elsewhere, there is no fundamentally new information included, and it is essentially a summary of the work of many investigators, the justification for its presentation being that, in my experience, so much could be done without incurring heavy capital expenditure to reduce the problem to smaller proportions, and yet the necessary urge or incentive appears to have been lacking. The effort will have been worth while if it is realised that in the not too distant future the law will provide the incentive if nothing else does so, and therefore the old advice still holds—'Assume a virtue if you have it not.'

It is difficult sometimes to adjust oneself to the new conditions in which we live, but there is much force in the observation of H. G. Wells that 'We live in a planning world. Everything we do is becoming preparatory and anticipatory. Today has vanished almost completely in our enormous preoccupation with tomorrow.'

Perhaps it may be better to look upon the problem as an administrative one involving consideration of science, economics, human relations, and even politics, in which there are no blacks and whites but only different shades of grey. If judgment is applied to the principle in this manner difficulties will recede as experience advances, particularly if coupled with the essential realisation that ultimately every plan works only through the individuals to whom are entrusted the details of it.

The whole question of effluent disposal is bound to continue in a dynamic state, because the general view as indicated clearly by legal enactments to date is in the direction of diminished pollution of the watercourses of the country. In this connection the gas industry is not being singled out for special attack, because industry generally is being forced to take steps to reduce pollution. Therefore, new methods and processes will have to be examined with care and in great detail, and they may in some cases have to be introduced, as suggested previously, even if they involve a charge on gas production.

Any proposed payment for treatment of effluent at the sewage works should be examined in the light of its relation to the cost, both capital and operating, of treatment at the gasworks—say, by distillation, dephenolation, or any other suitable process.

These considerations give added weight to the observations of our own Chairman, Mr. Chester[54], who, in his recent presidential address pointed out that the new Technical Committee of the Institution should be able to offer to the Gas Council and the area boards valuable technical advice and to assist them to carry out their obligations.

As stated previously, both the powers conferred on river boards by the passing of the River Boards Act of 1948, and the nationalisation of the gas industry, have emphasised the need for further investigation into the treatment of gasworks effluents and the prevention of river pollution.

Every attempt should be made to continue and even improve the goodwill which has been built up in the past between many gas undertakings and sewage authorities.

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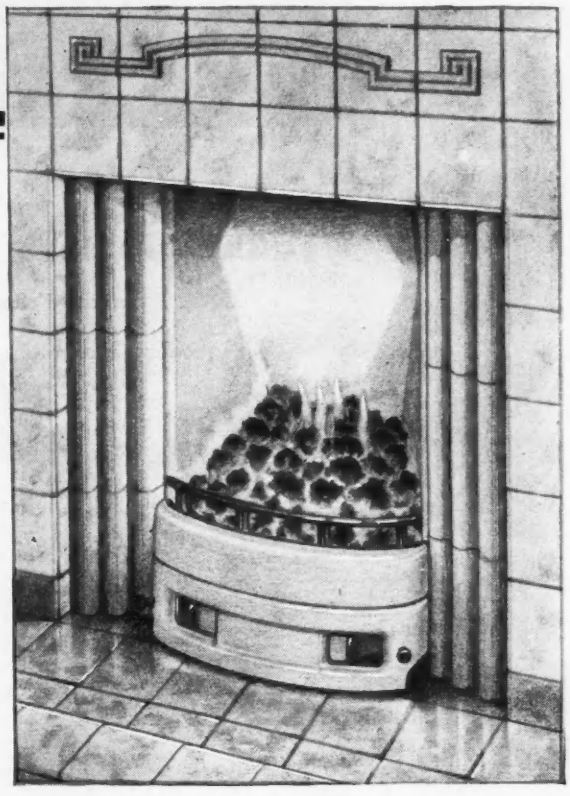
DISCUSSION

The Chairman **(Mr. H. H. Brown)** said Dr. Marsden was a recognised authority on the subject of effluents and the great trouble he had taken in compiling the references for their future guidance would be generally appreciated. The paper was a difficult one to discuss because so few of them were qualified to go into the biological and chemical reactions involved or to deal with the practical application of the principles of such changes. Those were matters for the sewage experts. Dr. Marsden had, however, given valuable guidance as to the best way to deal with the many problems involved in the disposal of gasworks effluents.

Referring to the Morse separator which members had seen earlier in the day in operation at the Torquay works, he suggested that it might be possible to assess the value of the separation in more detail by making a parallel comparison between two streams, one with corrugations and the other without. Although it was apparent that a lot of separation took place, one was not sure that it would not take place even without corrugations.

Regarding the important problem of correlating the main sewage flow with the outfall of effluent, particularly sulphate of ammonia or crude liquor effluent, experience at Exeter indicated that they got on much better with the sewage disposal authorities, where they had activated sludge to deal with the outfall, by studying the weather and regulating their operations during dry spells or spells of increased rainfall.

Dr. Marsden said the Chairman's remarks concerning the Morse separator bore out a lot of his own thoughts, but he had not the information sought by Mr. Brown available. He assumed that the people at Torquay had carried out some such tests as Mr. Brown had envisaged before they embarked on the purchase of the separator.



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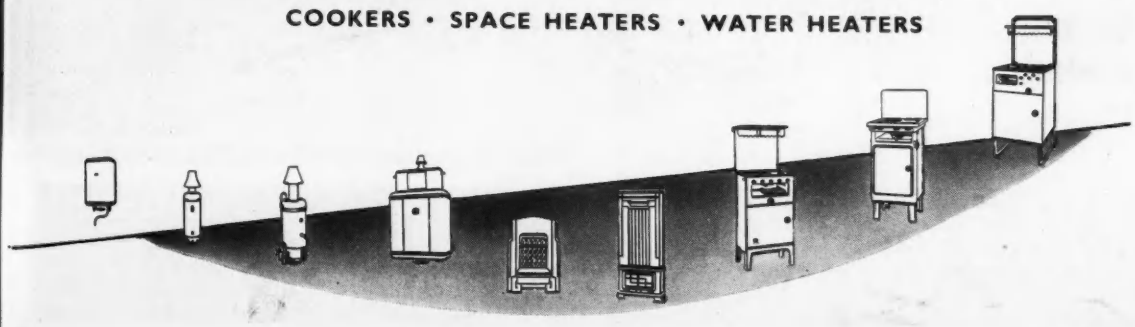

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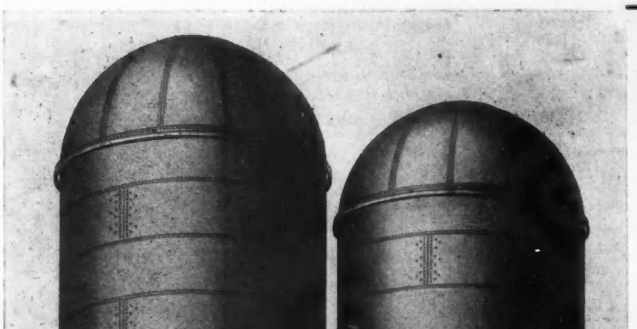

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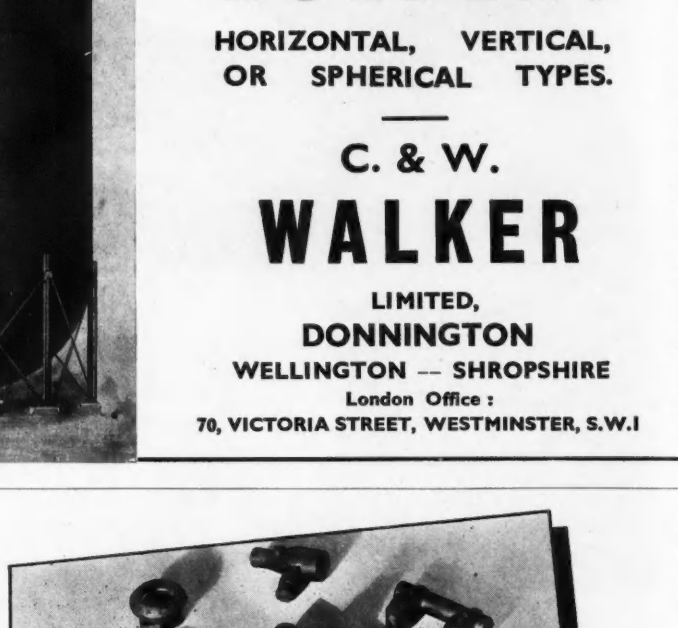

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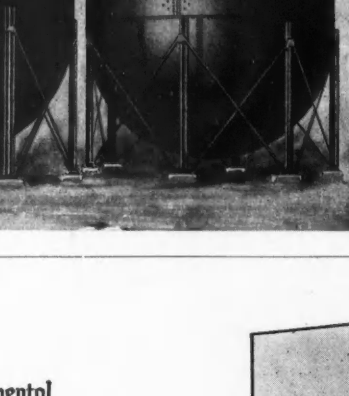

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Mr. J. W. Denton (Torquay) said the intake of the Morse separator was from a decanting tank which was previously an oil tank of 30,000 gal. capacity. They poured the liquor from the tar and liquor well in which—quite wrongly, he admitted—tar and liquor was stored together and they arranged a suction to take the liquor away without disturbing the tar, by keeping 2 to 3 ft. of liquor above the level of the tar. They pumped it for a period of approximately two hours per day, leaving the remaining 22 hours of each day for the liquor itself to settle. Towards the end of the period when they were going to run the liquor to the separators they ran back the residual tar or oil that had collected. At that stage they passed the liquor which had been decanted away through a coke filter for disposal.

Home Made Separator

Having heard of the Morse separator they made a crude one of their own as an initial experiment, using asbestos corrugation, and found there was something in it, and therefore went ahead and installed the Morse. Samples had been taken in Winchester bottles and comparisons made between liquor treated and not treated in the Morse separator. In the untreated liquor there was a sediment of about an eighth of an inch, but after the Morse separator there was only the finest skin at the bottom of the bottle and a little film at the top.

Mr. F. C. Ellis (Torquay) said that in preliminary work on the Morse separator they used sheets of perspex to carry out visual tests and the results were definitely better than on their older separator.

Mr. J. B. E. Patterson, M.SC., Provincial Advisory Chemist, National Agricultural Advisory Service, Ministry of Agriculture, said the use of gas liquor as a fertiliser seemed to be exciting interest all over the country at the present—possibly because of the urgency of the need to dispose of it without committing a nuisance. When one looked into the literature it was surprising to find what varied experiences were described, and although there were some vague statements of trouble occuring it was almost impossible to find explicit details. In Germany and Denmark the liquor had been used successfully on a wide range of crops and, in this country, useful work was done about 15 years ago at Tottenham and, for the past three years, at Brigg, in Lincolnshire.

It was unlikely that damage would occur to soil bacteria and other organisms from phenols, thiocyanates and cyanides provided that reasonable dressings were applied, but experimental work was required to settle this point, as well as the alleged long-term damage to clover, destruction of viability of seed, and alteration of *p*H and soil structure. Some of these points were already being investigated.

Most Suitable Application

The most suitable use at present for gas liquor was an old grassland soon to be ploughed up. Grass was damaged by scorching least of any crop, whereas application to arable crops could be made safely only directly to the soil. It was possible that good results might be obtained by using equipment similar to that used in America on a large scale for the distribution of liquefied ammonia (not solution), in which the fluid passed down through coulters and reached the soil 1-2 in. below the surface. To sum up—the use of gas liquor as a fertiliser was of interest to agriculturists, but until more investigations had been made on possible disadvantages, application to grassland was the most suitable and safest outlet.

Valuable information was contained in one of the B.I.O.S. reports from Germany in which it was stated that where liquor had been used on potato crops the results had been beneficial.

Dr. Marsden said that without questioning the efficacy of the American practice of applying 'liquefied gas' he wondered whether their action was prompted by a belief that the ammonia alone would function satisfactorily, or whether it was because they knew the Louisiana sulphur fields were running out.

Mr. Patterson replied that work of this kind had gone on for several years. It had to be regarded in the light of the fact that we seldom realised that sulphate of ammonia, regarded in this country as the chief nitrogenous fertiliser, was not so regarded in other countries.

The **Chairman** said it would be of interest to know what was the effect on the soil. Most coarse grasses seemed to flourish on a slightly higher *p*H value in the soil, while finer grasses flourished on a lower *p*H.

Mr. Patterson said much depended on the nature of the soil. The work at Brigg was on a clay soil and they had to use a certain amount of lime. It had been agreed that work needed to be done on ranging soils, including acid soils, because at present they did not know enough about the botanical side.

Mr. J. E. Wilkes (Torquay), referring to small filters, said he had found small coke of about 1 in. the best filtering medium. He doubted whether a mixture of coke from about $\frac{5}{16}$ in. with breeze would be as satisfactory.

Mr. T. L. Tallentire (South Cornwall) suggested that $\frac{3}{4}$ in. coke was ideal, but breeze was a safer medium than larger coke. In addition to the breeze filter they in South Cornwall had also made use of the hessian screen and had found it easier in application.

Southern Experiments

Mr. W. F. Thorne (Western Division, Southern Gas Board) said the author had warned them that it was necessary to face the fact that conditions either had changed or would do so in the near future. He assumed that the two factors he had in mind were the new Rivers Act and the national shortage of sulphur. There were still a few people, misguided perhaps, who were making sulphate of ammonia from ammoniacal liquor, and the national shortage of sulphur was going to affect them considerably. That led automatically to the question of the utilisation of liquor directly for fertilising purposes. In the area of the Southern Gas Board they had found considerable interest among farmers and in the Agricultural Advisory Committee in the question of the direct use of liquor, and they proposed to carry out some experiments. Some people said they were very silly, but there were others who said they were sensible.

Dr. Marsden had told them that crude concentrated ammoniacal liquor had been found to be effective and less toxic than ordinary ammoniacal liquor. In talking with people about its use he had found that the idea of using it direct was favoured, but there was a feeling in some quarters that the cost of transport might defeat its effective use. He suggested the possibility of a more highly concentrated liquor as a compromise between transport and other costs.

Dr. Marsden, replying to Mr. Thorne, said he had the new River Boards in mind, but the sulphur situation was not so acute at the time he wrote his paper as it was today. Since it had become acute the same arguments still applied.

Mr. A. C. Rea (Bath) said they were trying experiments at Bath directed to reducing the amount of effluent from carburetted water gas plant by recirculation, and they hoped by that means to save a lot of filtering. He asked whether Dr. Marsden felt that in the future they should make provision for reducing the H_2S in their concentrated liquor, and if they did, were they going to reap any economic advantage by doing so?

Dr. Marsden replied that he did not consider it would be economically sound to reduce the H_2S below the figure they usually had. They would all watch the recirculation experiments with interest; anything that could reduce the quantity of effluent was worth trying.

Remedies on the Doorstep

Mr. A. G. A. M. Gaston (Bath), speaking of concentrated liquor, said there was a good case to be made out, particularly where there was a charge for disposal of effluents and where there was a source of cheap steam available. A concentrated liquor plant could offset to an appreciable extent the charges made for disposal. It seemed remarkable that the gas industry could produce so much sulphur, and while they were discussing the disposal of effluents the remedy lay at their doorstep.

Dr. Marsden said there were so many remedies on the doorstep that he did not know what to say about sulphur. A large percentage of the nation's sulphur requirements could be met if the available sulphur was recovered from coke-oven gas. The question of making crude concentrated liquor was a matter of economics, in which the transport of the liquor was an important factor.

At the close of the discussion the Chairman informally thanked Dr. Marsden for his outstanding paper.

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COMPANY NEWS

COALITE & CHEMICAL

The thirty-fourth annual general meeting of Coalite and Chemical Products, Ltd., was held on July 18 in London. Commander Colin Buist, M.V.O., R.N. (the chairman), presided, and in the course of his speech, said: The year's trading yielded a profit of £461,131, compared with £340,038 for the previous year. From this has to be deducted depreciation, auditors' remuneration, interest on debenture stocks and taxation amounting in all to £279,761, leaving a balance of £181,370 which represents the net profit of the group. After deducting profits retained in the accounts of the subsidiaries, the net profit of the parent company is £174,208 which, with £138,984 brought forward from last year, gives a total of £313,192 available for appropriation. Of this total, £150,000 has been transferred to general reserve. The interim dividend on the ordinary stock of 3% (less income tax), will absorb a further £25,251 leaving a balance of £111,488 to be carried forward in the accounts of the parent company.

Including the unappropriated profits of the subsidiaries, there is a total of £125,158 to be carried forward in the consolidated balance sheet. Both the gross and net profits are records in the history of the company. After providing for the final dividend the capital and revenue reserves total £722,458 and the liquid resources of the group total £1,214,911. Output was maintained at a high level throughout the year. A new battery of retorts was completed and put into commission early in January. A further new battery is in course of construction and will be ready to meet the winter demand for 'Coalite.'

DANISH GAS COMPANY

The Directors of the Danish Gas Company announce that the Company's concession to supply gas to the City of Odense has been extended for ten years after January 1, 1954, when the present concession is due to expire.

The new concession-contract which will come into force on that date provides that the works, which will then be the property of Odense Commune, shall be loaned free of charge to the Company. New plant installed by the Company during the concession period will, upon termination, be taken over by the Commune at cost less agreed depreciation. The price of gas is to be fixed according to a table based on the c.i.f. cost of coal to the Company, but will be adjusted whenever necessary to provide a net income to the Company equivalent to at least 5% per annum on the capital invested by the Company in the undertaking. The yearly dividend may not exceed 8%.

Odense Commune will have the right to appoint two members of the Board of Directors. The contract will be automatically extended for further periods of ten years each unless two years' notice before the end of a period is given by either party.

It is with some satisfaction that the Directors announce this extension of the life of the Company beyond the century which it has almost completed, under conditions more favourable than any which it has enjoyed during its long history.

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The directors of George Kent, Ltd., manufacturers of industrial instruments, meters, etc., recommend a final dividend of 9½%, making 12½%, less tax, for the year ended March 31 last on the £296,747 ordinary. For each of the two preceding years total distribution was brought up to 10%, less tax, with a final dividend of 7%.

Gross profit for the year, after taxation, was £153,870, against £186,537, Provision for estimated U.K. income tax for 1951-52 is £171,932.

C. & C. WAKEFIELD

Shareholders of C. C. Wakefield and Co., manufacturers of lubricating oils and appliances, were warned early last month that further capital would be needed before long to finance the company's growing business. The directors indicate that the authorised ordinary capital is to be increased from £1,137,500 to £1,500,000 by the creation of 725,000 shares of 10s. each, and that a portion of these, subject to Treasury consent, will be offered to shareholders on 'such terms and conditions as the directors shall think fit.' It is evidently not the intention to issue all the new shares which are to be created. But even if the issued ordinary capital were raised to £1,500,000, last year's profits would still be equivalent to earnings of more than 60%. On the capital as it stands at the moment, the company last year earned over 80% and paid 37½%.

Following the announcement of the new issue, the 10s. ordinary shares fell 1s. 10½d. to 66s. 10½d., at which price the yield is over 5½%.

MUREX WELDING

The directors of Murex Welding Processes, Ltd., are increasing the final dividend on the £2,000,000 ordinary stock from 6% to 7½%, making 12½%, less tax, for the year ended April 30 last, compared with 10% for the previous year.

The total consolidated profits of the Murex group companies for the year are £759,000, after providing £890,000 required to cover the estimated taxation liabilities on the profits of the year; this compares with a consolidated profit of £350,000, and a taxation provision of £382,000, for the previous year. The directors have decided to appropriate out of the profits of the year £400,000 to meet contingencies on stocks held at current inflated and abnormal price levels. The total ordinary dividend for the year absorbs £133,750, after deduction of income tax and dividends on the 7% and 4% preference stocks amount to £10,481, after tax. These figures compare with £110,000 and £10,725, respectively, for the previous year. There was a satisfactory increase in the volume of sales of the company's products, although the shortage of certain raw materials affected the company's ability to meet demands in full.

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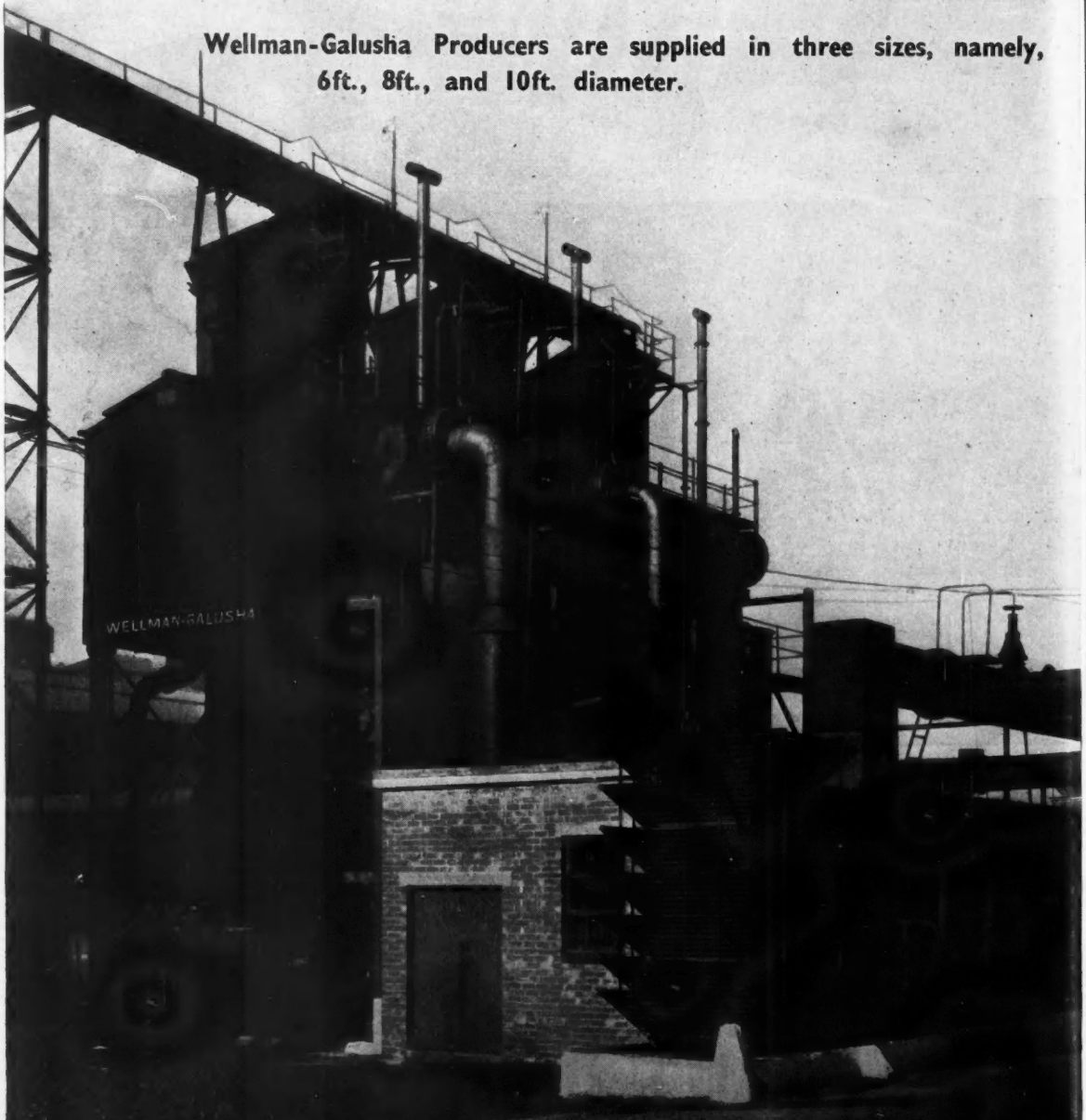

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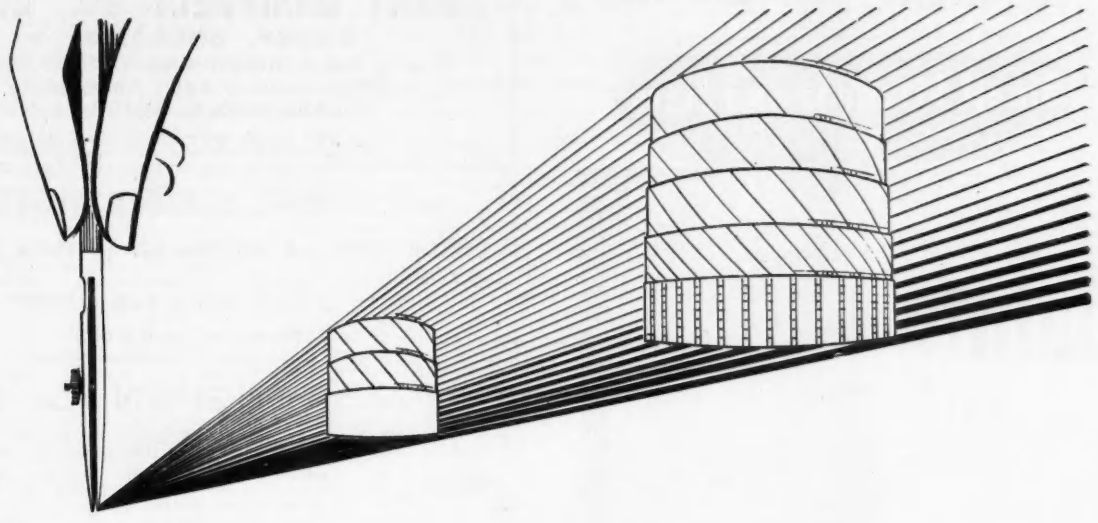

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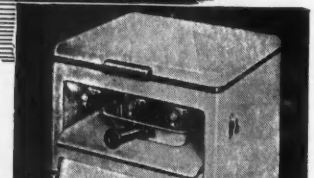

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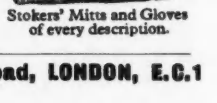

Stokers' Mitts and Gloves of every description.

Contractors' & Miners' Woollen Jackets, Trousers, Hats, &c.

244, Coswell Road, LONDON, E.C.1

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GASHOLDERS · PURIFIERS · WASHERS

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DUTCH AND DANISH BOG ORE SPECIALLY ACTIVATED OXIDE OF IRON

Oxide supplied on loan or sale outright. Highest prices paid for Spent Oxide. Send your enquiries to

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PALMERSTON HOUSE, OLD BROAD STREET, LONDON, E.C.2.

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Tins for Sale to Consumers. In Bulk for Works Use

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NU-SWIFT?

The World's Fastest Fire Extinguishers — for every Fire Risk

Pressure-operated by sealed CO_2 Charges

NU-SWIFT LTD. • ELLAND • YORKS

In Every Ship of the Royal Navy

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SUTTON WORKS, ARLINGTON AVENUE, ISLINGTON, N.1

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APPOINTMENTS VACANT

PROJECT ENGINEER for Gas Works, Tar Works and General Chemical plant. Salary from £700 per annum according to qualifications. Pension Scheme. Permanent Position. Apply to The Chemical Engineering & Wilton's Patent Furnace Co. Ltd., Horsham, Sussex.

NORTHERN GAS BOARD

WORKINGTON DIVISION.

FIRST CLASS GAS FITTER required for Cockermouth Unit. Category 'B' rate of pay. Cottage available at reasonable rental. Applications giving full particulars of training and experience to Divisional General Manager, Gas Works, Workington.

NORTHERN GAS BOARD

WORKINGTON DIVISION.

TECHNICAL ASSISTANT.

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at Whitehaven Unit.

Candidates must be experienced in the distribution of gas.

Salary will be within the range of Grade VI (£440 to £520) and placing within the Grade in accordance with age and experience.

The successful applicant may be required to pass a medical examination and subscribe to such scheme of superannuation as the Board may subsequently adopt.

Applications stating age, qualifications and experience together with the names of two referees should reach the undersigned not later than August 18, 1951.

J. GEORGE POPE,
Divisional General Manager.

Gas Works,
Workington.

WEST MIDLANDS GAS BOARD

WALSALL AND DISTRICT DIVISION.

A DRAUGHTSMAN is required for duties in connection with the Smethwick, West Bromwich and Oldbury Districts.

Applicants should have a knowledge of the distribution of gas and experience of general Drawing Office work.

The salary will be not less than £425 per annum on commencement, rising by annual increments to a maximum of £505 per annum, in accordance with Grade V of the salary scales of the National Joint Council for Gas Staffs.

The successful candidate will be subject to such scheme of superannuation as the Board may, in due course, adopt, and may be required to pass a medical examination.

Applications, stating age, qualifications and experience and giving the names of two referees, should be addressed to Mr. E. Hardiker, Divisional Manager, West Midlands Gas Board, Walsall and District Division, Walsall Factory Estate, Tame Bridge, West Bromwich Road, Walsall, to reach him not later than fourteen days after the appearance of this advertisement. Applicants are requested to quote ref. T.P.3, when replying to this advertisement.

F. H. CURETON,
Secretary.

WEST MIDLANDS GAS BOARD

WALSALL AND DISTRICT DIVISION

ASSISTANT WORKS CHEMIST—

SMETHWICK DISTRICT.

APPLICATIONS are invited from suitably qualified persons for the above position.

Applicants should have a sound knowledge of the control of gas manufacture and be experienced in carrying out all the usual Gas Works tests.

The salary for the post will be not less than £455 per annum on commencement rising by annual increments to a maximum of £535 per annum, in accordance with Grade VI of the salary scales of the National Joint Council for Gas Staffs.

The successful applicant may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt in the future. Any existing superannuation rights in the Gas Industry would be maintained.

Applications, stating age, qualifications, training and experience, should be addressed to Mr. E. Hardiker, Divisional Manager, West Midlands Gas Board, Walsall and District Division, Walsall Factory Estate, Tame Bridge, West Bromwich Road, Walsall, to reach him not later than fourteen days after the appearance of this advertisement. Applicants are requested to quote ref. T.P.3, when replying to this advertisement.

F. H. CURETON,
Secretary.

WEST MIDLANDS GAS BOARD

WALSALL AND DISTRICT DIVISION.

DRAUGHTSMAN—WALSALL DISTRICT.

APPLICATIONS are invited for the position of DRAUGHTSMAN at the Pleck Gasworks, Walsall.

Applicants should be capable of preparing Drawings and Estimates for Works' plant and repairs and be prepared to assist generally in the Walsall Reconstruction Scheme.

Experience in Gas Works Contractors' drawing offices and a knowledge of surveying would be considered an advantage.

The salary for the post will be not less than £500 per annum on commencement rising by annual increments to a maximum of £580 per annum in accordance with Grade VII of the salary scales of the National Joint Council for Gas Staffs.

The successful candidate may be required to pass a medical examination and the appointment is subject to any superannuation scheme as the Board may, in due course, adopt.

Applications, stating age, qualifications and experience, together with the names of two referees, should be addressed to Mr. E. Hardiker, Divisional Manager, West Midlands Gas Board, Walsall and District Division, Tame Bridge, West Bromwich Road, Walsall, to reach him not later than fourteen days after the appearance of this advertisement. Applicants are requested to quote ref. T.P.3, when replying to this advertisement.

F. H. CURETON,
Secretary.

(Amended Advertisement)

WEST MIDLANDS GAS BOARD

BIRMINGHAM DISTRICT

SWAN VILLAGE GAS WORKS.

ENGINEER,

APPLICATIONS are invited for the above position with direct responsibility to the Divisional Engineer.

The Works has a capacity of 8 million cubic feet per day of coal gas and carburetted water gas which will shortly be increased to 11 million cubic feet per day. In addition, a new Works, having a capacity of a further 11 million cubic feet per day, is under construction on an adjoining site.

The duties of the post will comprise complete supervision of the Works involving control of technical staff and labour with full responsibility for maintenance. A high standard of technical qualifications will be called for.

The commencing salary will be not less than £1,500 per annum, and the successful applicant will be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt in the future.

Applications should be addressed to the Personnel and Establishment Officer, West Midlands Gas Board, 6, Augustus Road, Edgbaston, Birmingham, 15, giving full particulars of age, experience and technical qualifications, together with the names of two referees, and reach him not later than August 13, next.

Applicants are requested to quote ref. T.P.3, when replying to this advertisement.

F. H. CURETON,
Secretary.

DISTRIBUTING ENGINEER required for progressive Civil Engineering Contractors, Central England, specialising in the laying, relaying and maintenance of gas supplies. Excellent opportunity for advancement for one with distribution experience and initiative—contracting experience **not** essential. Salary according to suitability, bonus, car or car allowance and expenses. Write in first instance giving age, details of education, training and experience, which will be treated in strict confidence, to No. 9968, *Gas Journal*, 11, Bolt Court, Fleet Street, London. E.C.4.

NORTH EASTERN GAS BOARD

ENGINEERING ASSISTANT.

AREA HEAD OFFICE, LEEDS, 2.

APPLICATIONS are invited from Engineers trained as Draughtsmen for the above position, at a commencing salary within Grade A.P.T. IX (£570-£670), the point of entry to be determined by qualifications and experience.

Preference will be given to candidates of Higher National Certificate standard, with experience in the design and repair of riveted and welded gasholders. Experience of erection and examination, and a knowledge of site procedure will be an advantage.

The successful applicant will be required to pass a medical examination and to subscribe to such superannuation scheme as the Board may adopt.

Form of application may be obtained from the Cheif Engineer, at the address below, and should be returned not later than fourteen days after the date on which this advertisement appears, quoting reference number G/J2.

J. C. GARDNER,
Secretary.

Bridge Street,
Leeds, 2.
July 3, 1951.

SOUTH EASTERN GAS BOARD

KENT COUNTY DIVISION.

DISTRICT SUPERINTENDENT—SHEPPEY.

APPLICATIONS are invited for the above-mentioned position.

The successful applicant will be required to control and supervise the work of the district gas fitters, to organise consumer service and to supervise main and service laying on the district. Experience in the preparation of estimates for all types of district work and mainlaying is essential.

Preference will be given to applicants with not less than five years' experience of this type of work and having one of the following qualifications:—

(i) The certificate in Gas Salesmanship and Consumer Service of the Institution of Gas Engineers.
(ii) The certificate of Gas Supply Technology of the City and Guilds of London Institute.
(iii) The I.G.E. Gas Supply Certificate (Ordinary Grade).

Providing the above experience and qualifications are possessed the salary will be within Grade VII of the National Salary Scales (Provincial 'A') in respect of Administrative, Professional and Technical Staffs (£500-£580 per annum).

Applications will be considered from persons who have not the experience and qualifications indicated above but who have—

(*a*) a good practical knowledge of gas appliances and their installation,
(*b*) practical knowledge of main and service laying; and
(*c*) general district or showroom experience.

The salary for a successful applicant in such circumstances would be within a grade lower than VII, with a prospect of promotion on obtaining the necessary experience and qualifications.

Applications in writing (quoting reference V.10/162) giving age, present occupation, experience, qualifications, etc., should reach the undersigned not later than fourteen days after the publication of this notice.

R. J. MCCRAE,
Personnel Manager.

Katharine Street,
Croydon.

THE BRISBANE GAS COMPANY

Queensland—Australia.

TECHNICAL OFFICERS.

APPLICATIONS are invited for the following positions:—

(1) PRODUCTION ENGINEER experienced in all aspects of Gas Manufacture preferably with latest type of Wests Continuous Verticals, C.W.G., and machine charged Horizontals to take charge of production under the direction of the Works Engineer.

Applicants should possess the Higher Grade Certificate (Gas Manufacture) and have received a thorough practical training in all production procedure, and be competent to take charge of the works, including labour if and when required. Age 25-30 years.

Salary £900 per annum (Australian) payable monthly.

(2) CONSTRUCTION & MAINTENANCE ENGINEER with a thorough knowledge and experience of Gasworks plant design, layout, maintenence etc., and be competent under the direction of the Works Engineer to prepare layout drawings of developmental Works projects including C.W.G. and take charge of installation and maintenance of plant and labour if required.

Applicants must have been engaged either on the staff of a large and progressive Gas Undertaking or a reputable Gas Engineering firm making, supplying and erecting Gasworks plant and equipment, not necessarily carbonizing plant. Experience in gas manufacture would be an advantage. Age 25-30 years.

Salary £900 per annum (Australian) payable monthly.

The present annual output of gas is 1,200 million cu. ft. but rapid developments are anticipated which could double the output within a few years.

The successful applicant for position No. 1 will be required to go to Australia by air and his family (if any) would be provided with Tourist accommodation to Brisbane by sea route.

The applicant appointed for position No. 2 would be provided with Tourist passages by sea for self and family (if any).

Travelling expenses will be paid on the basis that each appointee remains in the Company's service for three years.

Salaries payable from date of embarkation.

Applications for each position stating age, experience and full information regarding training qualifications and positions held, with *copies* of references and when available to be addressed to the undersigned who will supply further information regarding local conditions on request. Closing date August 20, 1951.

MESSRS. WM. COWARD & CO.,
3 St. James's Square,
London, S.W.1.

(*Classified advertisements continued on Supplement* 4)

APPOINTMENTS VACANT (ctd.)

EAST MIDLANDS GAS BOARD

GRIMSBY GROUP.

TECHNICAL ASSISTANT.

APPLICATIONS are invited for the post of TECHNICAL ASSISTANT at the Cleethorpes Works. Candidates should possess the Institution of Gas Engineers Higher Grade Certificate (Manufacture) and preference will be given to those having experience of continuous vertical retorts and C.W.G. plant.

The appointment will be made within the national grade A.P.T. VI (£455-£535) and will be subject to satisfactory medical examination and to the provisions of such superannuation scheme as may be adopted by the Board.

Applications stating age, and giving details of education, qualifications and experience, together with names of two referees should be sent to the undersigned to be received not later than August 6, 1951.

B. CLARKE,
Divisional General Manager.

East Midlands Gas Board,
Belle Vue House,
Carline Road,
Lincoln.

NORTH WESTERN GAS BOARD

LIVERPOOL UNDERTAKING.

ENGINEERING DRAUGHTSMAN.

A VACANCY exists in the Liverpool Undertaking for a qualified ENGINEERING DRAUGHTSMAN, equal to Section Leader standard, preferably with experience in the design and detailing of gas or chemical by-product plant. The salary will be within the ranges of £500-£580, £540-£620 or £570-£670 per annum, depending on qualifications and experience.

Applicants should not be more than 45 years of age, and the successful candidate may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt.

Applications should be made by letter, addressed to the Chief Personnel Officer, Radiant House, 18-26, Bold Street, Liverpool, 1, within fourteen days of the appearance of this advertisement.

NORTH WESTERN GAS BOARD

KENDAL GROUP.
HOME SERVICE ADVISER.

APPLICATIONS are invited for the above position.

Candidates should be qualified in Domestic Science and be experienced in the use of Domestic Cooking and Heating Appliances and in organisation of Cookery Demonstrations, lectures and district home service calls.

The commencing salary will be within Grade A.P.T. V (Provincial 'A'—Female) of the National Salary Scales (£340-£404 per annum).

The successful applicant may be required to pass a medical examination and to subscribe to such scheme of superannuation as the Board may adopt.

Applications suitably endorsed stating age, qualifications and experience, together with *copies* of two recent Testimonials should reach the General Manager, North Western Gas Board (Kendal Group) Gas Works, Kendal, not later than fourteen days after the publication of this advertisement.

NORTH WESTERN GAS BOARD

LIVERPOOL UNDERTAKING.

ENGINEERING DRAUGHTSMAN.

A VACANCY exists in the Liverpool Undertaking for a qualified ENGINEERING DRAUGHTSMAN, preferably with experience in the design and detailing of gas or chemical by-product plant. The salary, according to qualifications and experience, will be within the range of £455-£535 per annum.

Applicants should not be more than 45 years of age, and the successful candidate may be required to pass a medical examination, and to subscribe to such scheme of superannuation as the Board may adopt.

Applications should be made by letter, addressed to the Chief Personnel Officer, Radiant House, 18-26, Bold Street, Liverpool, 1, within fourteen days of the appearance of this advertisement.

NORTH WESTERN GAS BOARD

BLACKBURN GROUP.

DISTRICT DISTRIBUTING ENGINEER—BLACKBURN DISTRICT.

APPLICATIONS are invited for the above position at a salary within Grade A.P.T. VIII of the National Salary Scales (£540-£620 per annum).

The successful applicant will be responsible for the distribution of gas in a part of the Blackburn District's area.

Applicants should hold the Higher Grade Certificate of the Institution of Gas Engineers and have experience in the design and installation of high pressure gas supply.

The successful applicant may be required to pass a medical examination, and to subscribe to such scheme of superannuation as the Board may adopt.

Applications, stating age, qualifications and details of training and experience, together with the names and addresses of two referees, should reach the General Manager, North Western Gas Board (Blackburn Group), Cardwell Place, Blackburn, within twelve days of the date of publication of this advertisement.

NORTH WESTERN GAS BOARD

OLDHAM-ROCHDALE GROUP.
INDUSTRIAL ENGINEER.

APPLICATIONS are invited for the position of INDUSTRIAL ENGINEER stationed at Middleton covering the Middleton/Heywood district.

Candidates should hold the Higher Grade Certificate of the Institution of Gas Engineers (Gas Engineering—Supply), or an equivalent qualification, and have experience in the industrial uses of gas and the selling and maintenance of industrial gas appliances.

The commencing salary for the position will be within the range of £500-£580 per annum, in accordance with Grade A.P.T. VII of the National Salary Scales.

The successful applicant may be required to pass a medical examination, and to subscribe to such scheme of superannuation as the Board may adopt.

Applications suitably endorsed "Industrial Engineer" and giving personal details, particulars of training, qualifications and experience, together with the names and addresses of two referees, should reach the General Manager, North Western Gas Board (Oldham/Rochdale Group), Gas Offices, Dane Street, Rochdale, not later than twelve days after the publication of this advertisement.

(Amended Advertisement)

NORTH WESTERN GAS BOARD

APPOINTMENT OF
DEPUTY INDUSTRIAL RELATIONS OFFICER.

APPLICATIONS from suitably qualified persons are invited for the above post at the Board's Headquarters at a salary of £825 per annum.

The person appointed will be required to assist the Industrial Relations Officer in all aspects of industrial relations and staff establishment work including the activities of the joint negotiating machinery for the settlement of terms and conditions of employment of manual workers, intermediate grades and staff. Preference will be given to applicants who have some experience of the initiation of education and training schemes.

The successful applicant may be required to pass a medical examination and to subscribe to such scheme o superannuation as the Board may adopt.

Applications, appropriately endorsed, giving personal details and particulars of present position, training, qualifications and experience, should be addressed to the Secretary, North Western Gas Board, Bridgewater House, 60, Whitworth Street, Manchester 1, within fourteen days of the publication of this advertisement.

It will not be necessary for persons who applied in response to the previous advertisement to submit another application, as their original application will be reconsidered.

NORTHERN GAS BOARD

STOCKTON DIVISION.

TECHNICAL ASSISTANT.

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at the Stockton Unit.

Candidates should hold an I.G.E. Ordinary Grade Certificate in Gas Engineering (Manufacture), or equal, and have practical experience in the chemical control of Gas Works' Plant.

Major extensions are in progress offering the opportunity of valuable experience to the successful candidate.

Salary will be within the range of Grade A.P.T. IV (£275 to £460) and placing in the Grade in accordance with age and experience. Conditions of salary and service as set out by the National Joint Council for Gas Staffs.

The successful applicant may be required to pass a medical examination and subscribe to such scheme of superannuation as the Board may subsequently adopt.

Applications, stating qualifications and experience, together with the names of two referees, should be addressed to G.W. Perks, Engineer & Manager, Northern Gas Board (Stockton Unit), Thompson Street, Stockton-on-Tees, to arrive not later than Tuesday, August 14, 1951.

F. L. SCAIFE,
Divisional General Manager.

HUMIDINE
NON-SETTING PAINT
Used by the leading Gas Companies for the protection of lower plates and cuppings of Gasholders. The most efficient anti-corrosion paint in existence. HUMIDINE never cracks, never dries and is absolutely impervious to water. OXYGRAFITE GASWORKS PAINT is also manufactured by . . .
ASPINALLS
(PAINTS) LIMITED
CARLETON - SKIPTON : YORKS
TELEPHONES: SKIPTON 548/9
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PLANT FOR SALE

O.E.T. CRANES
FOR IMMEDIATE DELIVERY

FOR SALE: TWO-TON Capacity O.E.T. CRANES by "Morris." Span 31ft. 6in. Motorised all motions for 400/3/50 supply. Fitted magnetic brakes. Span could be altered to suit customers' requirements.

COX & DANKS LTD.
Frederick Road, Salford, 6.
Wadsley Bridge, Sheffield, 6.
Park Royal Road, London, N.W.10.
Langley Green, Oldbury.

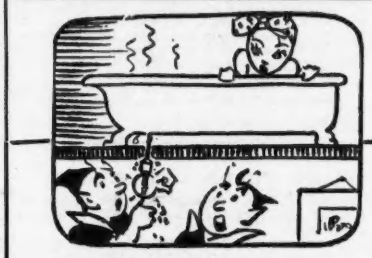
MISCELLANEOUS

SMALL single truckloads and larger quantities of good ROUGH BREEZE from any gasworks, large or small, in the United Kingdom required by merchants paying own railway tolls. Cash price and particulars to No. 9378, *Gas Journal*, 11 Bolt Court, Fleet Street, London, E.C.4.

MOISTURE TESTING for coal, coke and ash and many chemicals. Modern method is "SPEEDY" MOISTURE TESTER, giving accurate percentage water in 2-3 minutes. Already in use extensively in gas industry. Needs no electricity, no graphs. Portable, simple for use by unskilled labour. Write for illustrated brochure, or order direct. £21 10s. complete. Thos. Ashworth & Co. Ltd. (Dept. G.J.4), Basket Street, Burnley, Lancs.

PATENTS

KINGS PATENT AGENCY, LTD.
(Director, B. T. King, A.I.M.E., Patent Agent)
Advice Handbook, and Consultations free. 146a, Queen Victoria Street. London, E.C.4. Phone: City 6161.



THE "FLUXITE QUINS" AT WORK

"Cries of distress" shouted EE.
"You'll cop it m'lad, wait and see,
You'll need some FLUXITE
To put this job right.
You've punctured the bath-tub, strikes me!"

For all SOLDERING work—you need FLUXITE—the paste flux—with which even dirty metals are soldered and "tinned." It does not "poison" the solder nor corrode the metal—and can be used with safety even on sensitive apparatus.

With Fluxite, joints can be "wiped" successfully that are *Impossible by any other method.*

FLUXITE has been used for over 40 years in Government Works and by the leading Engineers and Manufacturers. OF ALL IRONMONGERS—in tins—From 1/- upwards.

The FLUXITE GUN puts FLUXITE where you want it by a simple pressure. Price 2s. 6d. or filled 3s. 6d.

ALL MECHANICS *WILL* HAVE

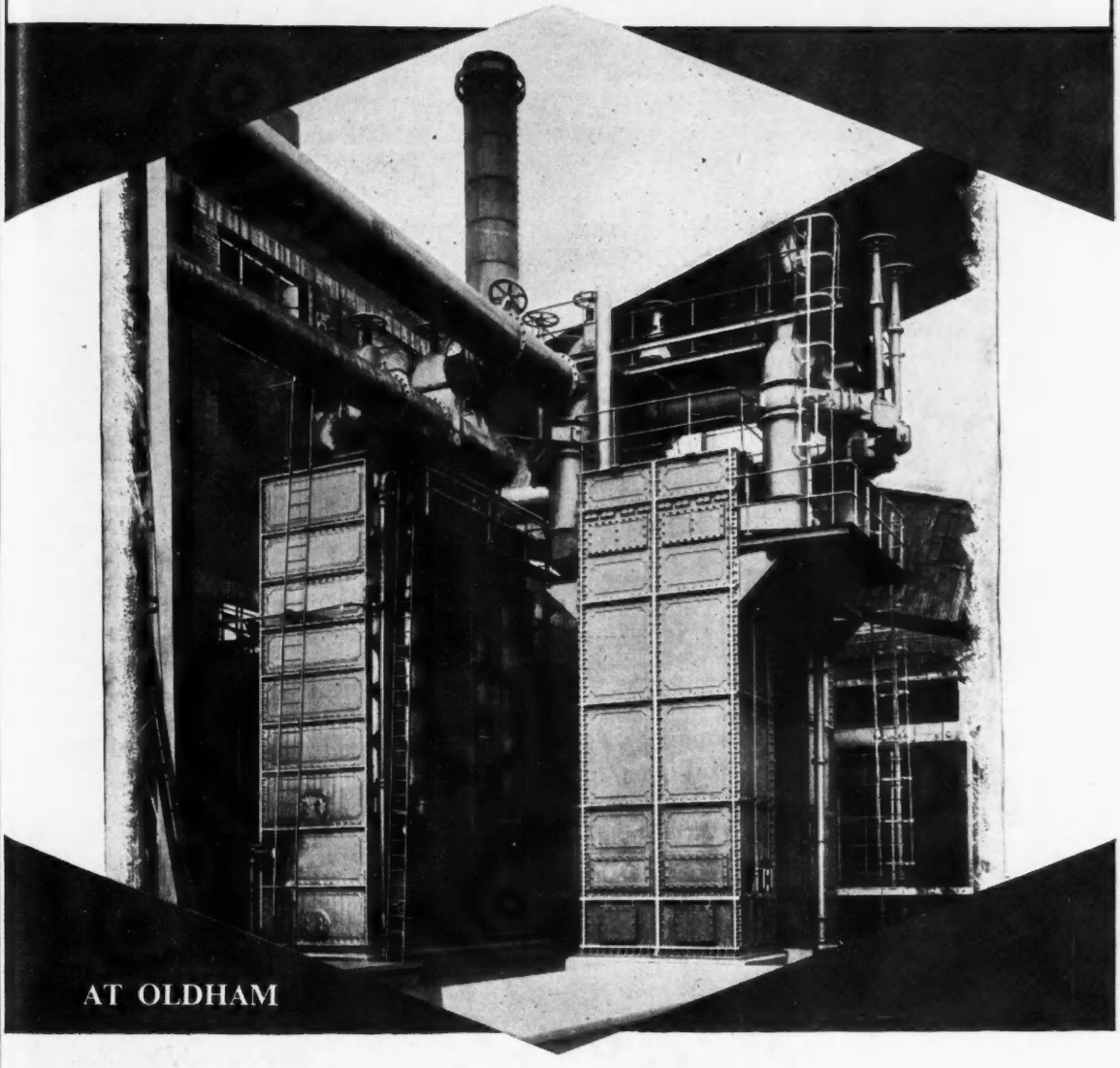
FLUXITE

IT SIMPLIFIES *ALL* SOLDERING

Write for Leaflets on CASE HARDENING STEEL and TEMPERING TOOLS with FLUXITE also on "WIPED JOINTS." Price 1½d. each.

Fluxite Ltd. (Dept. G.J.), Bermondsey Street, S.E.1

MODERN CONDENSING PRACTICE



AT OLDHAM

Two types of Holmes high efficiency Condensers installed at the Oldham Gasworks.

Left. Super Type Horizontal Tube Condensers mounted upon tar and liquor separators.

Right. Multipass Vertical Tube Condensers, incorporating Holmes patent sprays for maintaining clean internal conditions.

Reproduction by courtesy of the North Western Gas Board.

FOUNDED 1850
HOLMES
HUDDERSFIELD

W. C. HOLMES & CO. LTD · TURNBRIDGE · HUDDERSFIELD

Telephones: HUDDERSFIELD 5280 LONDON: Victoria 9971 BIRMINGHAM: Midland 6830

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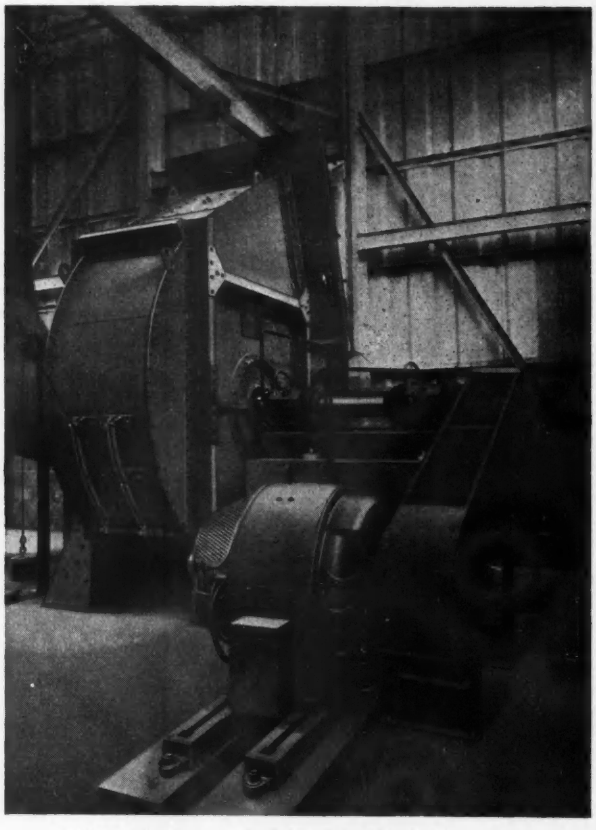


A Keith Blackman Induced Draught Fan in Operation.

VENTILATION — HEATING

GAS BOOSTING and EXHAUSTING — MECHANICAL DRAUGHT

FURNACE RE-CIRCULATING

FORGE and FURNACE BLAST — COLD AIR DOUCHE

MAN-COOLING — DRYING

WE make all types of Fans—"High Efficiency" for boosting or exhausting gas up to 3 lbs. p.s.i. and for volumes from 5,000 to 1,500,000 cfph; Cast Iron and Steel-plate "Pressure" fans for up to 2 lbs. p.s.i. air blast to furnaces, forges, water gas plants, burner equipment, etc; "Turbo" fans for applications requiring up to 6 lbs. p.s.i.; "Centrifugal" fans for draught on boiler fires to ensure economical steam production, or for cold air douche to workers in retort houses, etc.; "Centrifugal" or "Axial" fans for supplying ventilating air through ductwork; "Propeller" fans for moving air in volume for ventilating; "Propeller" fans on portable structures for cooling workers at furnace fronts; and "Tenaxe" fans for re-circulating high temperature gases and air in various types of heat treatment furnaces.

"KEITH-BLACKMAN"

FANS *for every purpose*

BOOKLET 20/8
Pictorial survey of K.B. products
FREE ON REQUEST

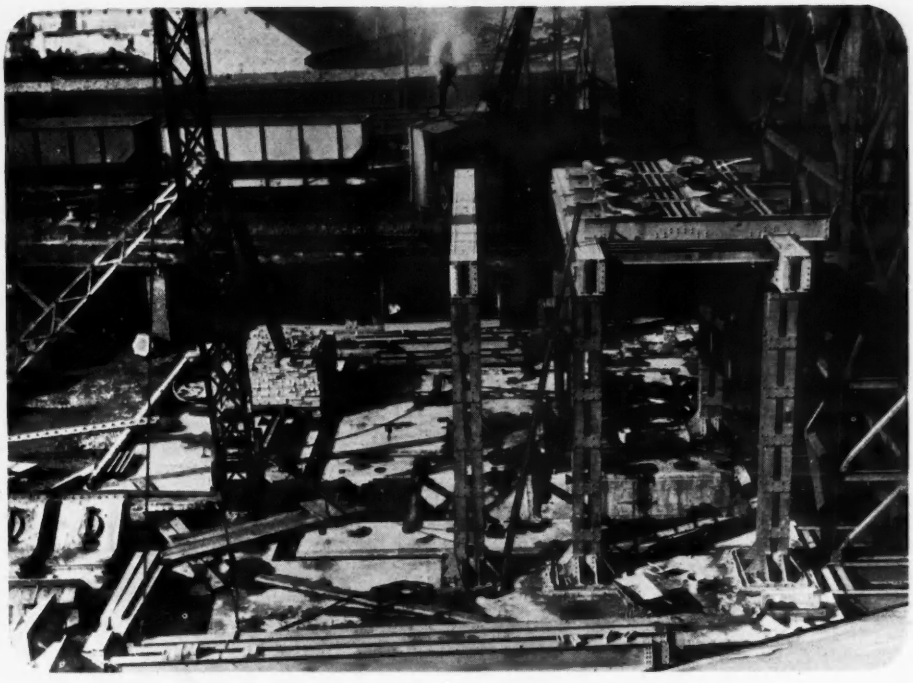
When you need Fans for moving air or gas give us an opportunity of making practical suggestions.

KEITH BLACKMAN LTD
MILL MEAD ROAD, TOTTENHAM, LONDON, N.17.
TN: TOTtenham 4522. TA: "Keithblac Norphone London."

MANCHESTER, 4: 26 Corporation Street. Tel. No.: Blackfriars 4228. BIRMINGHAM, 2: 75 New Street. Tel. No.: Midland 0317-8.
LEEDS, 1: 40/41 Royal Exchange Chambers. TN: Leeds 27286. NEWCASTLE-ON-TYNE 1: 21 Mosley St. TN: Newcastle 22284.
SCOTLAND: 90 Mitchell Street, Glasgow, C1. TN: Central 7973. IRELAND: 7 Brunswick St. Belfast. TN: Belfast 21114.
SOUTH WALES: 127 Stanwell Road, Penarth, nr. Cardiff. TN: Penarth 249.

Printed by STRAKER BROTHERS LTD., E.C.2, for WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET, LONDON, E.C.4. Wednesday, August 1, 1951.

Work in progress



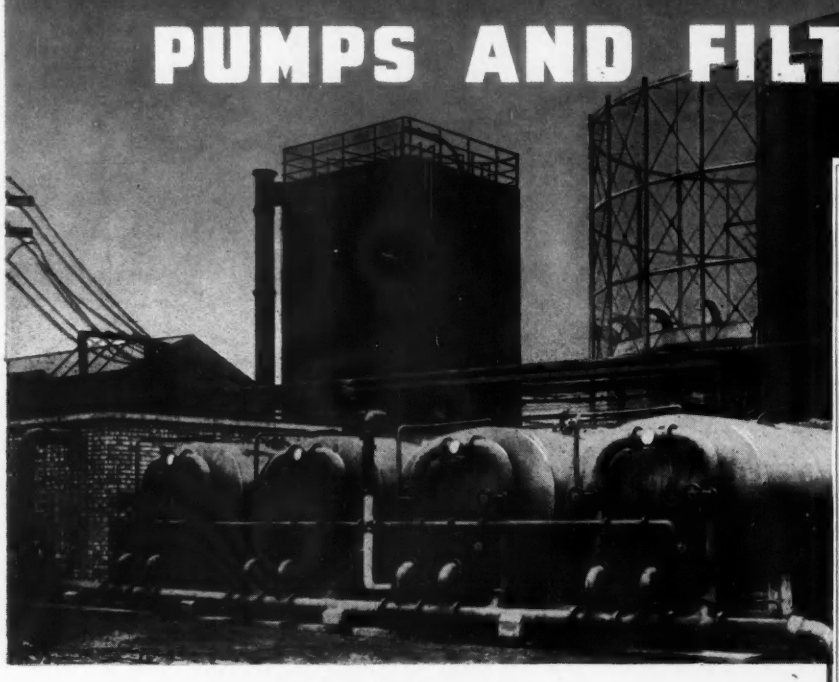
BLYTH

Main Stanchions and Girder-Floor for an extension of Glover-West Vertical Retorts.

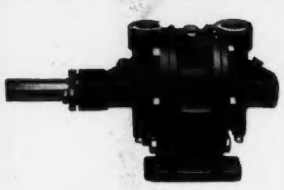
West's Gas
IMPROVEMENT CO., LTD.
MILES PLATTING, MANCHESTER, 10
Telephone: COLlyhurst 2961-5. Telegrams: Stoker, Manchester.
London Office: COLUMBIA HOUSE, ALDWYCH, W.C.2. Telephone: HOLborn 4108-9. Telegrams: Wesgasco, Estrand.

Pulsometer

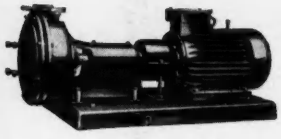
PUMPS AND FILTERS



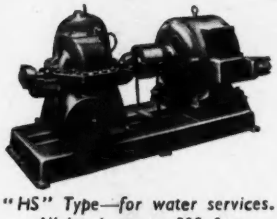
Filtration Plant in Gasworks



Rotary pump for Oil transfer duties.

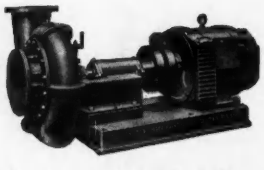


Stoneware pump for Corrosive and chemicals.



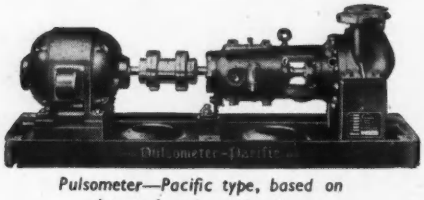
"HS" Type—for water services. All heads up to 500 feet.

The illustrations show centrifugal pumps for light and heavy oil and liquor duties, stoneware and special metal pumps for handling acids and alkalis, pumps for circulating and washer duties, for clean water and fire services and for liquids containing abrasives.

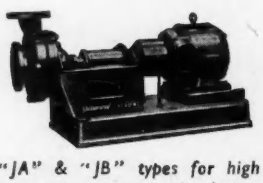


Slurry pump for coal washing and abrasive liquids.

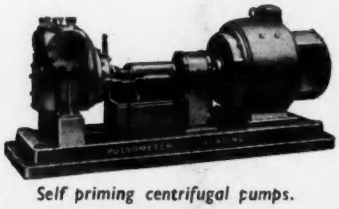
Turbine pumps for boiler feed or high pressure hydraulic services.



Pulsometer—Pacific type, based on latest American practice.



"JA" & "JB" types for high temperature water circulation.



Self priming centrifugal pumps.

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